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ANNUAL REPORT

OF THE

COMMISSIONER

OF

966

MINERAL STATISTICS

OF THE

STATE OF MICHIGAN,

FOR 1882.

BY AUTHORITY.

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Hon. Josiah W. Begole, *Governor of Michigan:*

Sir,—Herewith, in compliance with law, I have the honor to present my annual report as Commissioner of Mineral Statistics for 1882.

The labor of examining the mines and writing this report has been performed by Prof. C. D. Lawton, whose skillful services I have continued to retain. Prof. Lawton has lately visited all the mines in the State and described them from the notes which he has personally made.

It is proper to state that the statistics of the mines cannot be fully collected until after the close of the year and the companies have had time to make up their annual statements, etc. And thus while the volume is designated as the report of 1882, it is strictly such only in the matter of products. The mines have been mainly visited since the close of the year, and the descriptions which are embraced in the report relate to them as they appeared at the time the inspection was made, thus bringing them well forward into the year 1883.

The extended historical sketch of the early settlement, mineral discoveries and development in the State will, I feel assured, be found interesting and valuable. The chapter on the copper mines is very full and complete; the maps of these mines represent the work done during the past year, also several new maps have been added. With but few exceptions the present volume contains a map of every copper mine in the State, and as was anticipated when they were first introduced in the report of 1880, they have proved a valuable portion of the reports.

The part relating to the iron mines is made purposely brief for the reason that the last annual report contains full descriptions of these mines written as late as May, June, and July of that year, and the information regarding them is brought up to the date at which the descriptions were written. It will also be readily understood that the extraordinary depression which now exists in the iron business of the country, occasioning the suspension of many of the mines, and the abridgment of work in those that are operating, afford less to record. It is therefore deemed advisable to confine the statements relating to most of the iron mines to such additional facts and changes, etc., as seemed more especially noteworthy.

In submitting this the last report that it will be my duty to furnish, I take occasion to call attention to the fact that beyond reporting the products of such minerals as are subject to a specific tax, the law leaves it mainly to the discretion of the Commissioner as to how complete the report shall be. The undersigned has made it his endeavor to furnish such a report as should be of interest and value to the people of the State, and fitly represent their important mining interests. To this end the annual appropriation of $1,500 has been wholly applied, otherwise than in affording a salary for himself.

Very respectfully your obedient servant,

Marquette, Mich., 1883. CHAS. E. WRIGHT.

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HISTORICAL.

HISTORICAL SKETCH.

The chain of great lakes, in which the peninsulas of our State are situated, covers an area of 90,300 square miles, and constitutes, it is said, more than one-half of the fresh waters of the globe. With the exception of Ontario, the borders of Michigan are washed by the waters of all these great lakes, five in number, that have a depth and magnitude and afford an extent of navigation, reaching from the Atlantic ocean to the remotest shores of Lake Superior, which must ever give to her an advantage that, in this particular, no other inland State can hope to rival. At its southeastern extremity the State is touched by the waters of Lake Erie, a sheet of water that Baron La Hontan described in 1688 as "assuredly the finest upon earth." This body of fresh water is two hundred and twenty miles in length and forty-eight in width, and has a maximum depth of about two hundred and four feet. Its height above tide water is about five hundred and sixty-four feet. Connected with this by the Detroit river is Lake St. Clair, a shallow body of water, eighteen miles in length by twenty-two in breadth, and having a depth of twenty-four feet and an elevation of five hundred and seventy feet above the ocean. Thence by a second strait—the St. Clair river—we pass to the north upon the bosom of the Lake of the Hurons, a lake which abounds, says La Hontan in 1688, in the finest of trout and is seldom, according to the traditions of the Indians, visited with severe storms. Lake Huron, which mainly forms the eastern boundary of our State, separating it from the province of Ontario, is two hundred and fifty miles long, with an average breadth of about one hundred miles, and a depth of about nine hundred feet and a highth above tide water of five hundred and seventy-four feet. Its superficial area is about 20,400 square miles. Connected with this by the straits of Mackinaw, which latter separates the two peninsulas, and extending southward nearly parallel with it, and thus forming the entire western boundary of the lower peninsula, is Lake Michigan or "the Lake of the Illinois," as it was known to the early *voyageurs*. This great body of water, having but a single rival that excels it in magnitude, is three hundred and twenty miles in length, eighty in width, eight hundred and forty feet in depth, and its surface lies five hundred and eighty-seven feet above tide water, and it has a superficial area of 22,400 square miles. Green Bay, an arm of Lake Michigan, so important to the shipping interests of the upper peninsula, is one hundred miles in length, twenty in breadth, with sufficient depth for all purposes of navigation. If, instead of passing westward through the beautiful straits of Mackinaw into Lake Michigan, we continue northward from Lake Huron through the channels and between the shores of the St. Marie, avoiding the Sault by availing ourselves of the magnificent lock which the government has finally completed, we enter upon the surface of the southeastern extremity of "Gitchigumme"—Lake Superior—of our State. The southern shore of this, the greatest among bodies of fresh water found upon the earth, forming the boundary of the mineral peninsula, the northern limit of our State, is three hundred and fifty miles in length, one hundred in breadth, eight hundred and seventy-eight feet deep and six hundred and twenty-seven feet above tide water.

The pure waters of these lakes abound in fish, among which are some of the choicest varieties, as the Mackinaw trout and the white fish,—the latter found everywhere, and in great abundance. The waters are fed by innumerable streams, many of which reach far into the interior. The shores are indented with numerous bays and harbors, for the mooring of vessels and for providing wharves for loading and unloading of cargoes.

This entire superficial area covers not less than 100,000 square miles of surface. This immense shore line, and the numerous streams terminating in it, have greatly aided in the settlement of the State, by rendering all parts of it so accessible. The immense forests of pine, otherwise unavailable, are, through our water communication, readily attacked; the logs, in vast quantities, are floated down the streams to the mills at the mouth of the great rivers on the lake shore, where they are cut into lumber, which is loaded into vessels and transported to distant ports.

The ores in the northern peninsula, of which so great a quantity is now annually mined and shipped away, would be of little or no value, were this chain of navigable waters, in contiguity to which they are so conveniently found, removed, and the spaces now occupied by water should become dry land.

The broad, deep bodies of water lying upon either side of the lower peninsula are the great modifiers of the temperature of its climate. They are reservoirs for storing up the summer's heat, which is slowly eliminated during the cold season of winter, tempering the bitter blasts which sweep over their surfaces, and depriving them of their killing power.

The terrible storms from the northwest, that sweep over the open waters of Lake Michigan, mingle with the vapor ever rising from its bosom, and thus modified, they reach the borders of our State no longer endowed with the power to destroy. From this cause the western border of Michigan has become known as the fruit belt, a region where many of the choicest fruits are largely and profitably cultivated. The peach is produced with much certainty along the border of the lake, and for some distance into the interior; a fruit which finds a ready market in Chicago, and in the northwest.

The prosperous condition of the commonwealth of Michigan, due to its extensive coast line of navigable waters, its temperate climate, its ample rainfall and comparative freedom from destructive droughts, measurably due to the modifying influence of the great bodies of water which surround its borders, and the forests of timber which still dot its surface; the fertility of its soil, the variety of its products, the value of its timber, the wonderful richness and extent of its minerals, the intelligence, industry, and law abiding spirit of its people; the freedom of its laws, and the wise and economical administration of its public affairs, is rapidly exciting the attention of the civilized world, and rendering the State one of the most important in the Union. It is but a realization of some of the glowing descriptions given by the early French travelers who journeyed through the region, then inhabited only by wandering hordes of savages, and a few missionaries and traders, whose operations had reference to the fur trade carried on at the scattered posts along the frontier, with headquarters at Quebec and Montreal. To the French Jesuits who came into the region, the freshness and magnificence spread out the most magnificent visions. They not unfrequently descant upon the richness of the forests, the fertility of the soil, and beauty of the waters—inland seas, which are like oceans in the wilderness, peopled with an abundance of fish of the greatest value, and with wild fowl that skim over their surfaces, and snow white gulls that are tossed upon their waves. Herds of deer roamed through the forests and drank at the streams.

The country of lower Michigan is represented by these early travelers as bordered with a dense growth of trees, around whose enormous trunks grape vines were clustered, that ascended to the branches, from which they hung pendant. Advancing into the interior, the country is described as swelling into gentle hills and undulations, covered with forests of heavy timber, or groves of oak—which seem like parks,—or expanding into rich prairies or crystal lakes. Flowers of gorgeous hues varied the forest scenery. So that altogether it seemed as if nature, in this far off solitude, proud of her charms, had bordered this region, so richly endowed, with watery mirrors in which to reflect its enchanting beauties.

In contrast with the enthusiastic descriptions of the early French travelers through the region of lower Michigan, is that which prevailed many years later, but a short time previous to the final settlement of the country. The government surveyors, who first began the survey of the country, made very damaging reports regarding it, pronouncing it a nearly worthless region, not fit for settlement.

The following report among several of a similar tenor which I have met with, will illustrate how this unfortunate opinion respecting the character and value of the country, derived its source.

SURVEYOR GENERAL'S OFFICE,
CHILLICOTHE, November 30, 1815.

SIR:—The surveyors who went to survey the military land in Michigan Territory have been obliged to suspend their operations until the country shall be sufficiently frozen so as to bear man and beast. Knowing the desire of the government to have the lands surveyed as soon as practicable, and my earnest importunities to urge the work forward, they continued at work, suffering incredible hardships, until both men and beasts were literally worn down with extreme suffering and fatigue—the frost set in early, and the ice covered nearly the whole country, but broke through at every step, and the pack horses could not be got along with them, they were therefore obliged to submit to the climate and its attendant rigors, and desist for awhile, intending to attack them again as soon as they think it possible to proceed.

I annex a description of the county which has been sent to me and which I am informed all the surveyors concur in, it was only yesterday I received it, and heard of their return—so soon as their health and strength is recruited I expect to see them all, only one of them having been here yet—in the meantime I think it my duty to give you the information, believing that it is the wish of the government that the soldiers should have (as the act of congress expresses) lands fit for cultivation, and that the whole of the two millions of acres appropriated in the territory of Michigan will not contain anything like one hundred part of that quantity, or is worth the expense of surveying it, perhaps you may think with me that it will be proper to make this representation to the President of the United States and he may avert all further proceedings—by directing me to pay off what has been done and abandon the country—congress being in session other lands could be appropriated in lieu of them, and might be surveyed as soon as those in Michigan—for when the ice is sufficiently strong to bear man and beast, a deep snow would still embarrass the surveyors. I shall therefore wait to hear your answer to this communication before I proceed any further, thinking I should be unfaithful to my trust if I had lost any time in communicating the information received.

The country in the Indian boundary line from the mouth of the great Auglaize river and running thence for about 50 miles is (with some few exceptions) low wet land with a very thick growth of underbrush, intermixed with beech, cottonwoods, oak, etc., from thence continuing and extending from the Indian boundary line eastward, the number and extent of the swamps increases, with the addition of numbers of lakes from 20 chains to two and three miles across. Many of the lakes have extensive marshes adjoining their margins, sometimes thickly covered with a species of pine called "Tamirak," and other places covered with a coarse high grass, and uniformly covered from six inches to three feet (and more at times) with water. The margin of these lakes are not the only places where swamps are found, for they are interspersed throughout the whole country and filled with water as above stated, and varying in extent. The immediate space between these swamps and lakes, which is probably near one-half of the country, is, with a very few exceptions, a poor, barren, sandy loam land, on which scarcely any vegetation grows, except very small, scrubby oaks. In many places that part which may be called dry land is composed of little short sand hills, forming a kind of deep basins, the bottoms of many of which are composed of a marsh similar to those above described—the streams are generally narrow and very deep compared with their width; the shores and bottoms of which are (with a very few exceptions) swamp beyond description; and it is with the utmost difficulty that a place can be found over which horses can be conveyed. A circumstance peculiar to that country is exhibited in many of the marshes: by their being thinly covered with a sward of grass, by walking on which evinced the existence of water or a very thin mud immediately under that thin covering, which sinks from 6 to 18 inches from the pressure of the foot at every step, and at the same time rising before and behind the person passing over. The margins of many of the lakes and streams are in a similar situation, and in many places are literally afloat. On approaching the eastern part of the military lands towards the private claims on the strait and lake the country does not contain so many swamps and lakes, but the extreme sterility and barrenness of the soil continues the same—taking the country altogether so far as has been explored and to all appearances together with the information received concerning the balance, is as bad—there would not be more than one acre out of a hundred, if there would one out of a thousand that would in any case admit of cultivation.

With great respect I am your obedient servant,

EDWARD TIFFIN.

The Hon. Josiah Meigs, Commissioner G. L. office, Washington.

The above is an accurate copy, including peculiarities of orthography and punctuation.

The earliest settlements in Michigan, if such they may be called, were made by the French, commencing at Sault de Ste. Marie, in 1668, at which period a mission was founded at that point by James Marquette and Claude Dublon. The country had been visited, however, many years previously by the representatives of this nation, who had journeyed westward from Montreal and Quebec, and had traversed the borders of all the great lakes. The French under Cartier had landed at Montreal as early as 1535, and taken possession of the country in the name of the King of France. Again in 1540, an expedition under Marquis de LaRoque came to the country and a settlement was effected.

In 1608 an expedition under the guidance of Samuel Champlain founded Quebec. The design of the company, under whose auspices the expedition had been formed, was to engage in the fur trade, as it had been ascertained that the wilderness abounded in fur-bearing animals. And this motive seems mainly to have been the main spring of French colonization in the northwest, both at this time and subsequently. The first expeditions sought only for gold and silver, or other precious minerals, which not being found, it is probable that no permanent foothold in the country would have been attempted by the people of this nation, had it not been for the inducement of profits which the fur trade was found to afford. Added to the stimulus of traffic was the proselyting zeal of the Jesuits, who were first introduced into the country in 1622.

In 1627 the King of France granted a charter to a company, conferring extensive privileges to enable it to colonize the French possessions in America, to which was given the name of New France. Champlain was appointed the first governor. The colonists were barely able to sustain an existence during the next two years, and in 1629 when Sir David Kertk appeared before Quebec—which is an Algonquin word signifying strait—with an English fleet the dominion of the entire country was surrendered to the British crown. Subsequently in 1632, the French title to the region was restored by the treaty of St. Germain.

In 1655 a college of the order of the Jesuits was founded at Quebec, and thenceforward, through the zeal and influence of these worthy fathers, the exploration and colonization of the country were greatly extended, but little else however was effected save the prosecution of the fur trade, and the so-called conversion of the Indians, in which work a greater knowledge of the country was constantly obtained. A number of religious institutions were founded in Canada at this early period, for the purpose of christianizing the Indians, and at the same time to impress upon the savage minds, along with the rites and symbols of the church, the emblems of French sovereignty. Very little effort was made in agriculture or kindred arts. It became the policy of the authorities to encourage all the inhabitants in the direction of the fur trade; in this field the greater inducement for fortunes was afforded. The French succeeded in holding faithful to their interests the Algonquin tribes of Indians, but the Iroquois, the Five Nations, were their perpetual enemies, and through this enmity they were constant sufferers. The English held the seashore, and between them and the French settlements a constant jealousy existed.

French affairs approached a crisis, and seemed likely to end in ruin, when in 1661 the King of France sent out a reinforcement of four hundred troops, and it is probable that this timely aid saved the colonists from total annihilation at the hands of the Iroquois.

In 1664 the company of New France was dissolved, and its franchises surrendered to the crown, and an effort for the formation of a more perfect government was made.

Forts were erected on the principal streams, and in 1668, at the time of the settlement of the Sault de Ste. Marie, the general affairs of the country were much improved. Ports were soon after established at points on the shores of the great lakes.

In May, 1671, the governor general sent Monsieur de St. Lusson to the Sault de Ste. Marie to hold a grand counsel with the Indians. The French were met in council by the chiefs of fourteen tribes, and amid much ceremony formal possession of the country was taken, in the name of the King of France. In the same year, 1671, settlement was made at Michilimackinac by Marquette, who induced a party of Hurons to settle there as the nucleus of a colony. A fort and chapel having been built, it soon grew into and continued for the space of a hundred years to remain one of the most important trading posts on the chain of great lakes, situated in the beautiful channel which connects the two great lakes of Huron and Michigan. It was placed at one of the most conspicuous points in the great avenues of commerce between the St Lawrence and the Mississippi, and was for a long period a favorite rendezvous of traders, *voyageurs*, Indians, adventurers, and soldiers. A Jesuit school was maintained to further the efforts of the missionaries for the conversion of savages. On the north shore the mission of St. Ignace was founded. The savages at the post derived their principal subsistence from the fish in which the waters of the straits abounded. They resisted all efforts of the Jesuits for their conversion, since, according to the acknowledgment of the worthy fathers, the utmost extent to which they could bring the savage mind to sanction their efforts, was to permit the priest to administer the sacrament to young children and aged Indians.

A fort and chapel were also built at the Sault de Ste. Marie and like Michilimackinac was a favorite resort for the savages and traders on their way from Lake Superior to the lower settlements, and for the purpose of catching whitefish which were taken in great quantity in the rapids of the St. Marie river. A permanent settlement of Indians that were found here who subsisted by fishing were called by the French the *Salteurs*. A goldsmith resided in the village who manufactured candlesticks, bracelets, and other trinkets from copper that was found on the shore of Lake Superior. In 1670 a similar trading post was established at Green Bay, and at an early period at St. Joseph on the river St. Clair. No settlement was made at Detroit, although this point was among the earliest visited by the French in following the shores of Lake Erie westward. The excellent position of this point for a missionary and fur trading post was observed and commented on by the Jesuit fathers long prior to the actual establishment of any permanent foothold in the State being attempted.

From 1620, and possibly earlier, Detroit had only been occasionally resorted to by the missionaries in their efforts at conversion of the Indians, but as the French possessed a more direct and safer route by the way of Mackinaw and the upper waters of Lake Huron for their traffic from Montreal and Quebec with the northwest, the position at Detroit was not occupied. Even the remoter posts at Chicago, and at the mouth of the St. Joseph river, on the west shore of Lake Michigan, and the fur trade with the Indians reaching to the Mississippi river, found a more convenient outlet by the straits of Mackinaw than could be obtained by traversing the trails across the peninsula eastward from the head of Lake Michigan.

But the English colonists on the Atlantic coast in the east soon became rivals of the French in the fur trade, and began to extend their influence and traffic far into the country, which at first was exclusively occupied by the French. Instead of trading at Mackinac the Indians were induced in a measure to convey their peltries by the way of St. Clair, Detroit, Lake Erie, and Ontario to barter with the English at their posts in Schenectady, Albany, and New York. The English had thus built up an extensive trade with the Indians in the northwestern lake region and began to regard Detroit as a most desirable place as a *point d' appui* for their operations. Becoming aware of this eagerness on the part of the English to acquire a post on the Detroit river, and determined to forestall them, the French government fitted out an expedition for that purpose in 1701 under Antoine de la Motte Cadillac, lord of Bouaget and Montdesert, who, under a commission of the king conveying to him a grant of lands and endowing him with the title of commandant at Detroit, left Montreal with a body of one hundred men, a Jesuit missionary, and the necessary means for establishing a permanent colony. The party reached its destination in July and began the foundation of a settlement.

Previous to setting out with the expedition, however, the precaution had been taken to call a grand council of the Indians at Montreal, as had been previously done at the time of the occupation at the Sault. This council was one of the most imposing that had ever been held in the country, and was attended by the chiefs of the great tribes from the St. Lawrence to the Mississippi, and by the dignitaries of all the French settlements. The proceedings were ushered in and conducted with much pomp and ceremony; the respective claims of the two nations to the country were discusssd; their relations to the Indian tribes, complaints, and wishes of all the parties present at the council, were canvassed and weighed.

The Iroquois claimed possession of the country, and protested against the proposed measure of French occupation, alleging that they had already denied to the English the privilege of establishing this post in the territory. The final answer of the French to this argument was that the country belonged to the king of France, and that the matter of making a settlement at the proposed point had already been decided upon, and the plan would soon be carried into effect.

Cadillac, on his arrival, erected a rude fort in which were mounted the five small cannon which he had brought with him, and built some houses for the occupation of traders and the soldiers attached to his post.

The means of protection possessed by the French at the settlements, or trading posts, which were scattered along the shore of the lakes, were rude and meagre, serving, possibly, to overawe the Indians, but could easily be of much avail in case of a dire necessity. Their safety lay in the family relations which they succeeded in maintaining with the savage tribes by which their posts were surrounded. Among these were the Ottawas, a tribe somewhat distinguished for its agricultural pursuits, evidences of which were seen around their villages in the interior of Michigan; the Hurons, among whom the missionaries met with their greatest success in their efforts at conversion; the Pottawottamies, the Menominees, and the still more savage Chippewas, who occupied the country bordering upon Lake Superior, subsisting upon the fish obtained from its waters.

These, members of the Algonquin race, ever in the main remained friendly to the French and were their constant allies against the English, and their as constant and more terrible supporters, the Iroquois and Foxes. These latter regarded the French settlement at Detroit as an intrusion, and there was a constant desire on the part of the savage hordes, when power prevailed in its vicinity, to exterminate it. No serious outbreak, however, occurred until eleven years after the fort was founded, when in May, 1712, the Foxes made an attempt to destroy the town, incited thereto by the English, who wished to occupy the place themselves. In the vicinity of the fort were three Indian villages occupied by friendly tribes, the Pottawottamies, the Hurons, and the Ottawas, who were at this time absent on hunting expeditions. The commandant, M. Du Boisson, becoming aware of the intended attempt to destroy the fort, hastily dispatched couriers to recall his confederates. The attack began on the 13th but the timely return and coöperation of the absent warriors saved the beleaguered whites, and the struggle ended in the total defeat of their savage foes and the capture of their women and children, which were divided as slaves among the allies.

The Foxes, or Ottagamies, were the allies of the Iroquois, and the natural enemies of nearly every tribe in the Northwest, as well as of the French. To the latter they caused great apprehension and trouble. Marauding parties of this tribe not unfrequently met with French traders and missionaries, and murdered them with great cruelty. Their frequent and destructive wars with other tribes had finally its natural result in so far depleting their numbers that they were ultimately forced to collect their scattered remnants and retire beyond the lakes to the banks of the Fox river. Here united, and meeting with less opposition, they succeeded in commanding the country from the shores of Lake Michigan to the Mississippi river, now northern Wisconsin. Their warlike instincts and refractory habits, exercised against all parties that of necessity must so frequently traverse this country, resulted in uniting against them an expedition of French and Indians, who succeeded, at *Butte des Morts*, in destroying their power, and thenceforward they gave no further trouble to the French colonists.

In 1721 Peter Francis Xavier de Charlevoix, an accomplished Jesuit, was commissioned by the king of France to visit the country and report upon its character, and the condition of the settlements. His account of his journey, published in Paris in 1744, is one of the most interesting relations pertaining to this region to be found in the early annals.

He greatly admired the country, and became enthusiastic in describing its wonderful resources; the fertility of the soil, the forests of timber, the valuable minerals, and its navigable waters.

He entered into a description of Detroit, dwelling upon its location, natural advantages, and the jealousy earlier entertained by the English in their desire to obtain it. Nature, he says, seems to have denied to the country nothing which can contribute to make it delightful. Hills, meadows, fields, lofty forests, lakes, rivers, and rivulets; and all of them so excellent of their kind, and so happily blended, as to equal the most romantic wishes, and all set in a climate that is temperate and extremely wholesome. Notwithstanding the greater warmth of the climate at Detroit, this post was never regarded with so great favor as a point of traffic with the Indians, as Michilimackinac. The latter was further removed from British influence, and from the danger of incursions from the Iroquois. It was felt that the traffic at Detroit must be subject in a much greater extent to competition from their enemies, than at the more northern post. Besides, the old route by the Straits of Mackinaw or the Sault, and through the northern waters of Lake Huron, to Quebec, was always a favorite one with the early *voyageurs.*

A grand council with the Indians was held at Detroit during Charlevoix's visit, when he was greatly struck with the dignified bearing and eloquence of the Pottawottamie and Huron chiefs. The objects of the council were to induce the chiefs to consent to the prohibitions of the sale of intoxicating drinks among the savages, and to endeavor to unite them in a war against the Foxes.

This is, probably, the first meeting ever convened within the limits of Michigan, which assembled for the purpose of discussing the evils of intoxication, and for the adoption of a regulation to limit its spread. The chiefs spoke eloquently of the evils wrought among the Indians through the use of brandy, and admitted that it were far better had none ever been introduced, and while willing to leave the matter with the French, whether any thereafter should be sold to the Indians in general, the chiefs were of the opinion as to themselves personally, they had become so accustomed to the use of the stimulant that they thought that they could not do without it in future.

As before remarked at the early French stations along the shores of Michigan, agriculture was but little encouraged. The crops, which were produced, were limited to isolated patches of wheat and corn; such grains as were raised were ground by the use of windmills. The women, aside from their household work, employed their time in the weaving and manufacture of articles for traffic with the Indians. The law was centered in the commandant of each post, who became legislator, jury, and executor, and thus it followed that the peace and prosperity of the settlement largely depended upon the wisdom and vigor of the commanding officer.

These colonies had been planted on the borders of Michigan chiefly for prosecuting the fur trade, and the emigrants were naturally of a character calculated to engage with advantage in that industry. Save the few members of the aristocratic classes found among them, they were mainly derived from the shores of Normandy and Picardy, and were a hardy, adventurous race, capable of undergoing the fatigues and dangers of the forest and willing to meet any emergency. The inhabitants of the posts were a motley assembly, comprising the commandant, priests, traders, *voyageurs*, soldiers, and peasantry. They were a shifting population and moved from one post to another as necessity or inclination might determine.

The *voyageurs* were the guides through the wilderness. They were usually men with the blood of both races commingled in their veins. They combined the forest instincts of the savage with the wider intelligence of the white man. Familiar with every lake and stream and pathway of the remote forest region, they traversed the wilderness or propelled their birch canoes into the furtherest recesses, acting as guides to the merchants who went with goods to exchange for peltries, or as agents representing the traders in the traffic. In the Lake Superior country this class is not yet wholly extinct, and there still remain persons of Indian and French extraction who are esteemed as excellent guides in the explorations for timber and minerals that are now carried on.

But little trouble was experienced in the matter of food, as the forests afforded an abundance of game and the lakes and streams abounded in fish, while, as Charlevoix remarks, speaking of the white-fish, "nothing of the fish kind can excel it." The posts on the lakes were too far removed and the inhabitants too few to afford much opportunity for social display. The French assemblies at these points were generally of humble origin and were accustomed only to the simplest amusements. All the aristocratic and pretentious elements of society were gathered at Montreal and Quebec. On the lakes the social life partook of the free and easy character developed by the life among the Indians and roving habits of the fur trade combined with the gay disposition natural to the French people under whatever circumstances. The chief influence was exerted by the priests, and from them was obtained what little education was disseminated. The inhabitants were all fervent Catholics and were submissively obedient to the mild inquisitorial power exerted by the Jesuits.

Notwithstanding the great influence of the priests and the generally peaceful and amicable relations existing between the two races, the Jesuits were far from successful with the savages. The Indians regarded the priests with a measure of superstition and distrust akin to that with which they looked upon their medicine men. They adhered to their paganism which endowed every prominent natural object around the shores of Michigan with its special genii. Charlevoix relates that the Indians regarded the island of Mackinaw with especial reverence as the place of the birth of the father of waters by whom all the lakes and rivers were formed. Sacrifices were offered to Lake Superior as the chief work of his hands.

The want of liberality on the part of the French government in granting lands to emigrants was calculated to deter actual settlement in the country. Permissions of occupancy were given by the commandant, but titles to grants must be confirmed by the king and were loaded with conditions such as would hardly be submitted to even in the most densely populated countries. Those clogs that were thrown around the tenure of property during the French domination in Michigan were an effectual barrier to agriculture or extended settlement. Those in authority cared little beyond enriching themselves out of the profits derived from a monopoly of the fur trade. The prosperity of the colonies was of minor importance compared with the matter of accumulating personal fortunes, to which purpose the attention of the commandants was mainly directed. It thus became for their interest that the population should engage in the labor of procuring furs instead of tilling the soil in order that they might reap the greater profits.

No person, under penalty of death, was permitted to traffic with the Indians in their own territory beyond the posts without first procuring a license, the price of which was fixed at six hundred crowns. These permits were granted by the governor general to the merchants who annually sent canoes loaded with merchandise suitable for the traffic to the posts of Mackinaw and Detroit. The merchants in turn sold licenses to the post traders at an advance in price, or employed them in the traffic. A single license conveyed the right to load two canoes each manned by six men, and bearing merchandise valued at about one thousand pounds. The profits of a voyage were fully one hundred per cent on the entire outlay, the lion's share of which was naturally reaped by the merchant, who incurred little of the labor or danger of the the expedition, the active agents, the *voyageurs,* receiving but a moiety in consideration for enduring all the peril and hardship. L'Hontan describes, in 1685, the arrival of a fleet of twenty-five or thirty canoes laden with furs belonging to the *Coureurs des Bois.* The cargo of each canoe consisted of forty packs, each of which weighed fifty pounds, and valued at fifty crowns. These were followed by fifty more canoes belonging to the Indians, who were bringing their furs to barter for goods. Such occasions were attended with considerable ceremony preliminary to the opening of the traffic, in which all were allowed to participate; giving to the Indians, in exchange for their pelts, whatever commodities they might possess, other than liquors.

Under these conditions the settlements in Michigan remained at a standstill. The numbers at the stations sufficed for the fur traffic, and beyond that there was little interest, and no increase of prosperity. Even at Detroit, where some attention was given to husbandry, and where farms were scattered along the margin of the river, the total white population in 1751, fifty years after the settlement was founded, amounted to only five hundred souls. Added to these were the population in the three neighboring Indian villages, which were capable of mustering about four hundred warriors.

The other posts in the territory were, in point of numbers, of much less magnitude. The most important of these, Michilimackinac, at the northern extremity of the peninsula, consisted of a stockade fort, covering about two acres, enclosing a chapel and about thirty dwellings, occupied by as many families. Here, as before described, were collected the furs obtained of the Indians from the upper lakes, preparatory to shipment to Montreal. Here, also, the outfits were purchased for expeditions into Lake Michigan, Lake Superior, and the remotest regions to which the traffic extended.

The utter destruction of this post by the Indians transpired on the fifth of June, 1763, after its conquest by the English, and the massacre of the garrison, and the English portion of the inhabitants exhibits one of the most melancholy tragadies that transpired during the long period of rivalry between the English and French nations for domination in the northwest. Subsequently, immediately after, the destruction of the old French post of Michilimackinac, the English began a permanent settlement on the island of Mackinac, which in about 1766 became equally with the former, an important mart of Indian traffic, being one of the chief stations of the Hudson Bay Fur Company.

Previous to this, however, the control of the territory, with the surrender of Montcalm at Quebec in 1759, had passed from the hands of the French, who had so long held it. From the period of the earliest settlement the English and French powers had sought the dominion of the country, each possessed its adherents among the savage denizens of the forest, and the many wars incident to this long struggle for the mastery are replete with battles and massacres among the most bloody and cruel recorded in the annals of history.

The English held New England and New York and the eastern maritime frontier, while the French territory extended from the St. Lawrence over the lake region and westward to include that of the Mississippi river. Naturally, in so vast a region, there arose frequent disputes and jealousies regarding the ownership of much of the territory. The representatives of either nation are constantly extending their settlements and encroachments within the boundaries of lands claimed by the other. The French had gradually extended a line of settlements from Quebec to New Orleans, and elsewhere at points which it was claimed would command the greatest extent of territory. Besides those to the northwest and down the Mississippi, they had also, in about 1721, built a fort at Crown Point, to command Lakes George and Champlain, and subsequently advanced southward to Fort Du Quesne, which later became the scene of Braddock's defeat. The English fort at Oswego was captured. The French commanded the Niagara river, and thus the entire chain of lakes, together with the Ohio and Mississippi rivers.

Such was the situation in 1757, at the time of the inauguration of the measures which finally resulted, on the capture of Quebec by the gallant Wolfe, in the utter subjugation of the French power in the northwest. At the capitulation of Montreal in November, 1760, Detroit, Mackinaw, and all other places and territory then in possession of the French, were surrendered to the English crown. In the latter part of the same month, an English detachment, under command of Major R. Rogers, proceeded to Detroit, and received from Capt. Pign Bellistre the surrender of the post. Major Rogers was deterred from his attempt to proceed to Fort Michilimackinac by the severity of the weather, so that in December following, leaving Detroit with the captured stores, in command of Capt. Campbell, he returned to Fort Du Quesne. Thus, in 1760, ended the French power in Michigan. The wars, which were almost incessantly waged between the two nations, were scarcely felt along her borders. It was too far removed from the scene of the struggle to render its territory an available fighting ground, and the relations maintained by the French people with the Indians by whom they were surrounded were very amicable, so that these early French residents scattered along the shores of the lakes which make her territory, maintained a primitive and peaceful existence. The territory was a ranging ground for traders and missionaries. No settlements were made in the interior, and the only explorers who penetrated beyond the coast of the lakes were the missionaries and traders who followed the streams and the trails which conducted them to the villages, where, surrounded by silent and noble forest, in possession of the means of plenty, the Indian families maintained their primitive existence in happiness and contentment; the chief episodes among them being the occasions of the return of bands of warriors from successful raids in the far off English settlements in the east.

In the transfer of power from the French to the English government little change was made in the condition of the residents. The details of the fur trade remained in the hands of the *voyageurs* and local traders, save only that they were employed by English merchants instead of French, as of old. Previous to the advent of the English no coin had been used in the country; pelts were the medium of exchange. Nearly as much difficulty existed as heretofore in the matter of obtaining title to real estate. Horses had come after Braddock's defeat, brought back by the Indians who had participated in that massacre. Potatoes were first introduced by the British.

In whatever apparent resignation the French residents accepted the change, the Indians who had always been their friends and allies, received these innovations with suspicion, and looked upon the innovators with distrust and hatred. The French they regarded as the friends of their race, and it was with feelings of impatience and revenge that they saw them supplanted in the land. Instigated by this feeling, Pontiac, one of the most remarkable savages that figure in the annals of Indian warfare, succeeded in uniting the tribes for the extermination of the British, and thus was inaugurated a conflict, the first that made its bloody footprints in the soil of Michigan. This great war, known in history by the name of the chief actor in the sanguinary drama, began suddenly in May, 1763, by a simultaneous attack on several different posts. Pontiac was an Algonquin chief of the Ottawa tribe, and his extraordinary sagacity, mental vigor, and eloquence, gave him a commanding influence among the Indians. He loved the French, but he regarded the English as the destroyers of his race.

Making his home on a beautiful island above Detroit, surrounded by waters that he knew extended afar along the shores of the lands through which his people had roamed for ages, thoughtfully noting the inroads of the insatiable invader, proud, fearless, and unconquerable, who shall wonder at his resolve to stay the destruction of his people, and to redeem the power that he felt was surely slipping from his grasp!

The conflict raged throughout the entire region of the great lakes; all the forts in Michigan, save only Detroit, were immediately taken. The capture of Detroit was undertaken by Pontiac himself, but his well planned design for the surprise of the garrison failed of success through being betrayed to the commandant by an Indian girl.

St. Joseph, on Lake Michigan, St. Ignace, Sault de Ste. Marie, and Michilimackinac were captured. Of the latter tragedy we have a full and graphic description given by Alexander Henry, who was an eye witness of the murderous scene.

This station of Michilimackinac—Old Mackinaw it is now called—was on the south side of the straits about nine miles distant from the island, when, in 1760, after the massacre, the English established a fort and settlement.

Henry came to the country in 1760 as a trader, and was the first English traveler to visit the region. He lived in the region for sixteen years; he found the hatred so great among the savages against the English that he deemed it expedient, on the occasion of his first coming, to disguise himself so that the Indians should not recognize his nationality. At the time of his arrival at the fort, the garrison consisted of ninety-three men, including officers, and there were about thirty families. After his arrival he was visited by a body of sixty Chippewa warriors, each with his blanket thrown over his shoulder, his tomahawk and scalping knife in hand; with feathers thrust through their noses, their faces painted with grease and charcoal, and their nearly naked bodies daubed with clay. After seating themselves and assuming their pipes, the chief, Minavavana, thus addressed him:

"Englishman, it is to you that I speak, and I demand your attention.

"Englishman, you know that the French king is our father. He promised to be such, and we in return promised to be his children. You know that his enemies are ours.

"Englishman, we are informed that our father, the king of France, is old and infirm; and that being fatigued with making war upon your nation, he has fallen asleep; during this sleep you have taken advantage of him, and possessed yourselves of this, his lands. But his sleep is nearly ended. I think I already hear him inquiring for his children. When he awakes what must become of you? He will destroy you utterly.

"Englishman, while you have conquered the French, you have not conquered us. We are not your slaves. These lakes, these woods, and streams, and mountains are ours and our inheritance, and the Great Spirit has filled them with the animals and fishes, which are the food for his children.

"Englishman, our father, the king of France, employed our young men in warring against your people. Some of them were slain at your hands and their spirits cry out for revenge.

"Englishman, your king has never sent to us any presents, nor made treaty with us, therefore are we still at war. The king of France is still our father and our friend. But you have come among us unarmed for the purpose of trade; rest tranquil without fear of the Chippewas. Brother, we present you with the pipe of peace."

Shortly afterwards Henry was visited by a party of Ottawa warriors, numbering two hundred, who came from L'Arbre Crocke, a station seventy miles west from Michilimackinac, at the entrance of Lake Michigan. Henry was accompanied by two other traders and one of the chiefs addressed them:

"Englishmen, we, the Ottawas, were informed of your arrival in this country with goods of which we are much in need. We were pleased, for we thought that with your assistance our wives and children would be better able to pass another winter, but we have learned with regret that the goods are not intended for us as we had expected; that you are going with them to distant countries, even among our enemies. Our wives and children have come to us crying, and we come to you to learn the truth or falsehood of the report. We see your canoes ready to depart, and find your men engaged for the Mississippi and other distant regions. We are suffering, as you see. We have considered, and now make known to you our determination, which is that you shall give to our men, young and old, ammunition and goods to the value of fifty beaver skins, each on credit, for which I doubt not they will repay you in the spring."

Previous to the attack the Indians had gathered in great force at Fort Michilimackinac. A friendly Chippewa had given Henry hints of the attack, which he conveyed to the commandant, Major Etherington, but, of which he, unlike Major Gladwin at Detroit, took no notice. On the previous day the Indians repaired in great numbers to the traders to purchase tomahawks, and were greatly interested in examining the ornaments and trinkets which Henry held for sale, stating that they would come again on the following day, the manifest design being to be prepared to pillage.

No precautions were taken. The massacre took place on the king's birthday, which was held as a holiday, and while a game of ball was in progress the Indians, at a preconcerted signal, rushed through the pickets and began their murderous work. Completely taken by surprise the garrison offered little resistance. Twenty of them were killed and scalped, and in the frenzy of their brutish triumph, the savages drank the blood of their victims, and even boiled, as Henry declares, and ate their flesh. Four hundred Indians participated in the massacre. The buildings and fort were entirely destroyed. Henry escaped with his life through being concealed by an Indian girl, but was soon after taken prisoner and by a mere whim his life was spared.

The siege of Detroit lasted for a year and was finally ended by the advance of Gen. Bradstreet with 3,000 troops, a force that the Indians could not hope to successfully meet. They immediately sued for peace, and a treaty was made which ended the terrible Pontiac war, Pontiac himself refusing to concur, but abandoning his old retreats near the people whom he hated. He retired to Illinois where he was assassinated by an Indian. The tribe, however, to which his slayer belonged, paid dearly for the act, as the Chippewas and Ottawas in revenge united in exterminating them.

After the close of the Pontiac war the English sought to conciliate and win over the Indians and French to their interests. More liberality was exercised in matter of granting lands; some settlements began to be made, and a better system of laws was introduced. The fur trade, however, still continued to be the predominating industry. In 1766 the Hudson Bay company, which so long exercised an almost absolute and despotic dominion over the extreme northwest, extended its operations to Michigan. The island of Mackinaw became one of its important posts, as it did also that of the northwest and the American companies. At the annual season for the return of the fleets by the traders, and the assembling of the Indians for traffic, this beautiful and romantic rendezvous became a scene of great animation; the transparent waters were dotted with canoes and bateaux; merchants, traders, *voyageurs*, gaily bedecked savages, coming from every quarter to trade, commingled in traffic and social revelry. For fifty years after the occupation by the British, this place continued to retain the same relative importance that it had held for a century before as a merchantile post in the romantic traffic which formed the basis of the commerce of the northwest. Half savage and half civilized, it was a track filled with hardships and romantic incidents. A long period of dominion it gained no permanent foothold, and lives only in remembrance. How greatly in contrast are the bateaux of the traders with the commerce of to-day! The products of the fur hunter with the products of the miner! The simple paddle of the savage is supplanted by the powerful wheel of the steam ship, and the bateau of the *voyageurs*, which bore away the fur of the beaver, is displaced by the innumerable vessels that bend their masts to every breeze, and pass with care and safety to and from the great lake around the foaming rapids. The beautiful straits, so replete with tragedy and historical interest, no more reflect from their silvery waves the gleam of the scalping knife. Over the graves of the murdered victims, who heard affrighted the war whoop of their savage foes, now echoes the shrill scream of the locomotive's whistle.

The council fires have gone out before the fiercer heat of the smelter; the crack of the hunter's rifle is drowned by the ring of the axe of the lumberman and the crash of falling pines; the silent trapper has fled before the steady advance of the miner, and in his stealthy footsteps treads the eager searcher for minerals.

The rocks, so rugged and forbidding to the early traveler, now yield untold millions of wealth. The results of the fur trade in this region sink into nothingness in the light of the labors of the miner. Where was the beaver dam, is the stamp mill; where was the fox's den, is the mining shaft; where was the trail through the forest or the portage between the waters, is now the railroad and the magnificent canal. For every canoe and bateau of the earlier industry, is now a vessel of steam or sail, loaded with ore or copper or merchandise;

and where were only the rude wigwams of the savage, or the simple chapel of the missionary, are now seen the growing city and village, teeming with life and activity.

The early missionaries who first traversed the coast of our mineral peninsula encountered much at which they marveled. More than two centuries have elapsed since its wonders were first described, but it is marvelous and wonderful still. The reality of its resources infinitely transcend the most sanguine conjectures of the early travelers, and this "fag-end of creation," as Baron L' Hontan epitomizes it in 1688, stands among mineral districts, as does the great lake whose waves it limits, among waters, with no "superior."

No doubt considerable search was made for precious minerals, and, indeed, in the early annals, mention is sometimes made of the failure to find gold and silver in fulfillment of previous conjectures. An abundance of copper for the manufacture of trinkets, was picked up on the shores of Lake Superior and along the streams, and even the big mass of copper lying on the bank of the Ontonagon river, twenty miles above its mouth, was seen and described by L' Hontan in 1688, by Charlevoix in 1721, and by Henry in 1765. Eight years thereafter Henry made an abortive attempt at mining in the vicinity of this mass, but not with the view of obtaining copper; he hoped to find gold and silver. Mr. Norburg, a Russian gentleman, with some scientific attainments, also interested in this mining attempt in which Henry engaged, found upon the shore of Lake Huron, a mass of eight pounds weight, containing considerable silver. This piece was carried to England and deposited in the British museum. This mining adventure transpired at about the time of the breaking out of the war between Great Britain and her colonies in America, by which the latter won their independence. It is possible that, had the times been more propitious, a better result might have been attained, and a copper mining industry have grown up. Experience has proven that mining is influenced by many causes other than the presence or absence of the mineral which is sought.

The long war incident to the struggle for independence transpired beyond the limits of Michigan. None of the scenes were enacted within her borders. The French and Indians, however, sided against the colonies in the struggle, and the posts of Detroit and Mackinaw were the rendezvous at which were congregated hostile savages, who set out in marauding bands to prey upon the white settlements in the east, receiving on their return compensation for the scalps which they had taken in the expedition, but the territory remained otherwise quiet. Arms were furnished and scalps paid for to such of the savages as could be induced to war against the Americans.

The peace, which followed in 1783, left Michigan within the borders of the new nation, and was claimed by several of the Eastern States as "crown lands," under virtue of grants from the English sovereign. These claims were relinquished in favor of the United States, with the view that the sale of the lands should realize a fund that would extinguish the debt created by the war. Congress enacted in 1780 that out of this northwest territory, ceded to the general government, future states should be created with the same rights and privileges as were possessed by the others; at the same time Congress voted to reimburse each of the colonies for its expenses incurred in the war.

Congress became thus possessed of all the lands lying northwest of the Ohio river, and in July, 1787, this region was organized under the title of the Northwest Territory. This act has become known in American history as the ordinance of 1787, and has formed the basis for all the subsequent Congressional territorial legislation pertaining to any portion of this region. The chief feature of this celebrated ordinance was the prohibition of slavery forever within the borders of the territory set up. Religious freedom was guaranteed; the *habeas corpus* and the right of trial by jury; education was encouraged; the system of government provided for is such as is now found in our territories. General Arthur St. Clair was made the first Governor. For a long time, however, there was little increase of settlement in Michigan. English enmity was directed in fomenting and increasing the natural jealousy and hostility of the savages. The Indians resisted settlement in Michigan, and notwithstanding the fact of its conversion to the United States by the terms of the treaty with the English government, the actual and unobstructed possession of the country was not obtained until 1796. Up to this time British troops were stationed at Detroit and Mackinaw, and at other points beyond Michigan, to compel, as it was claimed, the fulfillment, on the part of the Americans, of the stipulations of the treaty. But the undoubted object was, whatever the pretense, to obtain some final advantage through the animosity of the Indians against the Americans, to cripple the development of American industry in the northwest, and possibly regain a permanent foothold in the country. Every effort was made to unite the northwestern tribes against the Americans. Several great councils were convened at Detroit, which were largely attended and were the occasions of interesting deliberations, and every effort was made by the English agents to unite the savages against the Americans.

Alexander McKenzie, well known in the annals of the history of the extreme northwest through a long period, attended one of these meetings of the representatives of a large number of tribes, at Detroit. He came, himself so well disguised as an Indian, as to escape detection, and by his wily arguments, aided by other causes, succeeded in inducing the Indians to take up arms against the United States. In this war General Harmar, with a force of fourteen hundred men, was defeated near Chillicothe, Ohio, and many of his men were massacred. General St. Clair, governor of the territory, immediately took the field with two thousand men; in October, 1792, he was drawn into an ambush by the Indians, near the Miami villages, and defeated, with great loss. General Anthony Wayne, who succeeded to command, soon after administered to the Indians most severe punishment, defeating them in battle on the Maumee, and destroying their villages and fields of corn, and establishing important military posts in their country.

This most decisive campaign of General Wayne disheartened the savages, and overthrew the insidious projects of the English to obtain possession of the country by treaty with the Indians, should they have successfully resisted the power of the United States. A treaty was made in 1795 with the Indians, and in the following year the posts at Detroit and Mackinaw were abandoned by the British, and were immediately occupied by American troops. Thus, for the first time, the stars and stripes floated unchallenged over the soil of Michigan. There were at this time but few American residents in the territory; all the whites were French and English.

In 1798 Michigan sent one delegate to the convention of the Northwestern Territory, held at Chillicothe. The choosing of this officer constituted the first election that was held under the United States government.

In 1802, the State of Ohio being created out of the northwestern territory, Michigan was annexed to Indiana. By act of congress, passed January 11, 1805, Michigan was erected into a separate territory on the plan set forth in the ordinance of 1787.

Up to this period population had not much increased, no lands were brought into market, the Indians still adhered to the ownership of the soil, and were instigated by English commissaries, and agents of the Northwest Fur Company, to claim that they should be left in undisturbed possession of the territory excepting the small portion that had been ceded.

Tecumseh and his brother, the prophet, began the work of organizing all the tribes of the country bordering on the lakes into a confederacy to resist the Americans, and drive them back beyond the Alleghanies, thenceforth to be themselves left the sole possessors of their hunting grounds and be subjects of the British crown. The Chippawas, Pottawottamies, and other Michigan tribes were members of this confederacy, and their hostile demonstrations became alarming to the settlers.

Open conflict with them, under Tecumseh, began in 1811 on the Wabash, and in the following year, when congress declared war against England, they allied themselves with the British forces. At this date the total population of the Michigan territory was estimated at four thousand eight hundred and sixty. Of this number two hundred and eighty were at Mackinaw, the Sault, and in the vicinity; the remainder were at the settlements near Detroit. Four-fifths of these people were French, the remainder were British and Americans. The garrison at Detroit numbered ninety-four, and that at Mackinaw seventy-four. A public land office was established at Detroit in 1804, for the purpose of adjusting claims of title, arising under the various governments that occupied the country.

In 1807 Gen. Hull, by a treaty with the Indians, succeeded in making the first considerable progress in obtaining an undisputed title to the lands, but the lands thus obtained did not come into market until ten years later. There were about four hundred farms in the territory. The subsistence of the people was to a considerable extent derived from the forest, as wild game existed in abundance, and the chief commerce of the towns was the traffic in furs.

The knowledge of the declaration of hostilities was first conveyed to the Michigan posts by their enemies and was followed soon after by their surrender to the British and Indians. Mackinaw had but a small garrison and was surrounded by a force of one thousand men, mainly Indians, and its surrender demanded. The commander, Lieutenant Hoaks, concluding that defense was useless against so great a force, complied with the demand. This event occurred on the 17th of July, about one month after war was declared, and with the demand to surrender came the first intimation of the declaration of hostilities.

Gen. Hull, who commanded at Detroit, after making some offensive demonstrations against the British upon the Canadian side of the river, retreated to Detroit, when, with scarcely a blow, he ignominiously capitulated to the British on the 16th of August. Gen. Hull had previously ordered the evacuation of Chicago, so that thus early in the war these important posts were in the hands of the British.

In January, 1813, one of the most infamous and blood-thirsty events of the war occurred on the River Raisin. The American forces, consisting of about one thousand men, were defeated, after severe fighting, by the greatly superior numbers of the British and Indians, and finally surrendered to General Proctor, after which the wounded and prisoners were indiscriminately massacred in the most cruel and atrocious manner.

The settlements in Michigan and elsewhere on the frontier were at the mercy of the English and their savage allies, until Perry's great victory on

Lake Erie destroyed the British fleet on the lakes, and opened the way for the advance of General Harrison into the northwest, and the restoration of the captured posts to the American control.

Soon after, the utter defeat of the British and Indians under Proctor and Tecumseh left Michigan in comparative safety. An unsuccessful attempt was made to recapture Mackinaw, in which Maj. Holmes, a gallant officer, was killed. The post was surrendered at the close of the war.

After the fall of Tecumseh, peace was concluded with the Indians,—the Chippewas, Pottawottamies, Ottawas, and Miamis, and in 1815,—Feb. 17,—peace was proclaimed with Great Britain, and this territory was thenceforth relieved from British power.

There is no doubt that up to this time, since the treaty of 1783, the English sought to reposses the region bordering on the great lakes. Their agents continually incited among the Indians animosity to the Americans, and they only awaited a suitable opportunity to espouse their cause. Such an event would undoubtedly have occurred if General Wayne had met with the same fate as did Harmer and St. Clair. The success of General Wayne in completely defeating the Indians at all points alone prevented the British from affording openly the counsel and assistance to the Indians which they had all along secretly rendered.

On the departure of Gen. Harrison, Gen. Cass was left in command, he having been previously, in 1813, appointed as governor of Michigan. The territory was in a wretched condition, and the energies of the governor were directed to rebuilding the towns, reviving such business interests as could exist, and in conciliating the Indians.

Congress, in 1812, ordered the survey of two millions of acres of land in the territory of Michigan, for the soldiers of the war, but the parties who were sent forward to prosecute the work, made such an unfavorable report regarding the country, declaring it to be in the main swampy, sterile, and worthless, that the act was repealed and the same quantity of lands were directed to be surveyed in Illinois and Arkansas.

However, during 1816 and 1817, a portion of public lands were surveyed in the territory, and were brought into market.

And this fact began to bring into the country an increase of population. In 1819 the territory sent its first delegate to congress. The population in 1820 numbered eight thousand eight hundred and ninety-six, who were located mainly at the settlements at Detroit and above and below that place, on Lake Erie and at Mackinaw, at Sault de Ste. Marie, and a few at other points, as St. Ignace, St. Joseph, etc.

Detroit contained a population of 1,405, and had 250 buildings. Mackinaw, which continued the principal station for the fur trade for this region, had a normal population of 450, greatly augmented at the seasons of the return of the parties who were mostly absent in the forest region of Lake Superior, collecting furs. The settlement comprised 150 houses. This beautiful island is about nine miles in circumference, its bold shores rise to a hight of 300 feet above the waters surrounding it. Its name, Michilimackinac, is said to mean in the Chippewa tongue, turtle back, a name given to the island by the Indians, from its fancied resemblance to that animal. The village is situated upon the low bank near the water and in the rear the land rises abruptly to the main surface of the island; upon the bluff overlooking the town and the straits, stands the fort.

At the Sault were about twenty buildings and a half dozen families—French and English—besides some half breeds and Indians. These people were also exclusively engaged in the fur trade. Nearly all the specie that found its way into the territory was that disbursed by the government in the payment and support of the troops that were stationed on it.

In 1819 the steamer Walk-in-the-water, the first one launched upon the lakes, and the only one up to that time, made her first trip to Mackinaw.

On the 24th of May, 1820, Gen. Cass, with a well selected party, set out on his important expedition of exploration, which included the southern shore of Lake Superior. The objects of this journey were to examine the country so far as means would permit, and obtain thereby a knowledge of its soil, minerals, and general resources; also to get a better knowledge of the strength and disposition of the various Indian tribes inhabiting the lake coast, and to select sites for one or more military posts among them.

Considerable conjecture was felt regarding the existence of copper, and in a less degree, of other minerals, and it was among the chief projects of the expedition to make as far as possible geological and mineral investigations.

At the Sault de Ste. Marie a council was held with the Indians, who objected to establishing a military post at that point, a thing which the governor had determined to do. The prompt and decided action of the governor soon brought the Indians to terms; a treaty was made, and the decision required from them was obtained.

Until the construction of the ship canal the Sault de Ste. Marie was the terminus of navigation to the lower lakes and the post of navigation in Lake Superior, and from time immemorial it was an important point in the great Indian thoroughfare from the lower lakes to the shores of Lake Superior and the far north and northwest. The early French travelers selected it as one of the first points at which a settlement was made, and ever after, while the French nation held its power in the county, maintained a post there. The French seemed to have had an intimate knowledge of the country, and to have chosen their places for settlement with unerring judgment, as at Mackinaw, connecting the straits between Lake Huron and Lake Michigan, the Sault de Ste. Marie, connecting the passage between Lake Huron and Lake Superior, St. Joseph, now Fort Gratiot, the straits between Lake Huron and Lake St. Clair, and Detroit controlling the channel, which conveys the waters of St. Clair into Lake Erie, and the particular spots which they selected for the erection of their forts are those which later observation shows to be the best that could possibly have been chosen.

With the Indians the Sault was of further value by reason of the great quantities of white-fish which the waters afforded and the ease with which the Indians were able to capture the fish. To great numbers of the Chippewas, these white-fish were almost their sole food; they ate them fresh from the water in the summer and cured, by smoking and drying them, a store for winter consumption.

Even at this time, so late as 1820, the fur trade at the Sault and Mackinaw was of considerable importance, as Mr. Schoolcraft, a member of this expedition, states that he witnessed the descent of 11 barges loaded with fur, on their way to Mackinaw, and on setting out the following day they encountered five other barges also heavily loaded with fur, and eighteen or twenty canoes bound to the same destination. Three important companies had participated in this traffic, but at this period the so-called American Fur Company held nearly unlimited control of the field. The business for a single year is given by Mr. McKenzie in 1787 as follows:

Beaver skins, 106,000.
Bear skins, 2,100.
Fox skins, 1,500.
Kit fox skins, 4,000.
Otter skins, 4,600.
Musquash skins, 16,000.
Martin skins, 32,000.
Mink skins, 1,800.
Lynx skins, 6,000.
500 Buffalo robes and a quantity of costumes.
Wolverine skins, 600.
Fisher skins, 1,650.
Raccoon skins, 100.
Wolf skins, 3,800.
Elk skins, 700.
Deer skins, 750.
Deer skins dressed, 1,200.

The canoes used by the Indians of the northwest, and adopted by the French *voyageurs*, and the explorers, traders, and all others who traveled in the region of the upper lakes, are a conveyance among the best adapted for the purpose which it served, that has ever been devised. For lightness, strength, and ease with which it may be propelled, it has never been surpassed, if equaled, among the vessels that have been used by primitive races in ancient or modern times.

The Indians of the New England States used the "dug-out," a canoe made from a log, as did the ancient Germans and Gauls. But the birch-bark canoe of the northwestern Indians is constructed entirely of the bark of the white birch, cedar splints, sewed with thread of the small roots of the spruce, and the seams rendered impervious to water by being pitched with the gum from the yellow pine. When completed they have an astonishing degree of lightness, and were so perfectly adapted to the exploration of such a country as borders on the great lakes, and to the commerce and travel of the trappers and Indians, that one regards them with a feeling of admiration and pleasure. They were constructed of all sizes, varying from the capacity sufficient to carry a single person, to a magnitude sufficient to bear the burthen of eight thousand pounds. A canoe of this capacity is thirty-five feet in length, and six feet in breadth in the widest part, the sides coming together at the ends in a wedge.

The frame-work of the vessel, composed of light elastic cedar splints, is first set up, and covered with the large sheets of the birch bark, which is taken unbroken from the tree. The bark is sewed to the splints by using the long thread like roots of young spruce trees, and the seams where the bark joins are sewed in the same manner. It is further stiffened by sewing to the rim of the vessel a splint running along each edge. All the seams are rendered water tight by being thoroughly coated with pine pitch, which, by boiling, is made thicker, and hardens thoroughly when dried. Provision is made in large canoes for a mast and sail, and also seats are suspended from the gunwale by strings. The paddles are made of cedar, a wood which is exceedingly light, straight-grained, and elastic.

Such a vessel is easily repaired, can be borne on the back over portages, around falls and rapids, and can be used as a covering by night, or in a storm.

In this simple but adequate vessel, all the lakes, rivers, and streams of the north and northwest have been traversed and explored; they were the only conveyance used by the savages, and were adopted by all the Europeans who came among them.

In the surveys of the public lands, in the exploration for copper and iron, and in the early mining work on Lake Superior, the birch canoe was invaluable. Nor has it yet altogether disappeared from use here in upper Michigan. There are still individuals and parties engaged in traversing and exploring the wilderness, in whose outfit the canoe is an indispensable adjunct. It has indeed played an important part in the early history and settlement of Michigan.

Schoolcraft, in his journey along the south shore of Lake Superior, found, frequently, specimens of copper. The party passed through Portage lake, thence up to the mouth of the Ontonagon river, which they ascended twenty miles to view the then celebrated "copper rock," that lay upon its bank. This mass of copper is a conspicuous object in the early history of this country, being mentioned and described by all the early travelers from L'Hontan to McKenzie, who have written of the country.

Previous to the opening of the mines on Lake Superior, masses of pure native copper had been seldom seen, and none of such magnitude as this one was reported to be was known to exist anywhere in the world. It was one of the romantic objects belonging in this wonderful region that was associated in men's minds, who had read the description of this wild region, with the island of Mackinaw boldly rising from its watery horizon, with the Sault de Ste. Marie, with the wonders of pictured rocks, and the many grand and picturesque objects, and charming scenes, which had been enthusiastically described by the few who had traversed the country. It was, indeed, a far off and rugged country, a region of conjecture, and the mystery of the great copper mass harmonized with the general impression entertained regarding the country. Its occurrence, and the frequency with which smaller pieces of the same metal was found, suggested great possibilities, and led to much conjecture.

The journey to reach it, following the river through the chasm in the range, was one attended with great fatigue, along a frightful and forbidding path, in a solitude so profound as to impress one with an instinctive desire to depart from it. Mr. Schoolcraft, who, with Gen. Cass, visited this "copper rock," rightly conjectured that others would be found in the vicinity, since it proved but a trifle compared to the many great masses that were afterwards obtained in the mines near the banks of this river.

The early Jesuit fathers started missions at other points on the shores of the lakes within the limits of our State, some of which were but temporary. One of these made there early was at L'Anse, at the head of Keweenaw bay, and on the east shore of Lake Michigan were several of these missionary stations, —one on the St. Joseph river above the mouth of that stream. During the period of the French occupancy of the country this was an important station, and a fort was also established and maintained there. This river in an early day was an important thoroughfare; it was ascended for one hundred and twenty miles with canoes, where by a short passage they connected with waters flowing into Lake Erie. Indians and travelers, to a considerable extent, followed this route from Lake Erie across to the head of Lake Michigan, and thence to Chicago to the prairies of Illinois, or down the river to the Mississippi. This mission of St. Joseph is described by the early French travelers and missionaries. They represented the soil as rich and fertile, and the forests of oak, walnut, and maple as most magnificent. It was among the favorite camping grounds of the Indians. The sandy shore to the north of St. Joseph gave but a poor indication of the rich country lying beyond these sand hills in the interior, but the numerous streams, the St. Joseph, the Paw Paw, the Black river, the Kalamazoo, the Grand river, the Muskegon, the Pentwater, etc., were all navigable for canoes nearly to their sources, and by means of these numerous tributaries, thus extending far into the interior, and by portages over the divides of the peninsula, connection was had with the rivers emptying into Lake

Huron, St. Clair, or Lake Erie. Near the mouth of the Marquette river, it is stated by Charlevoix, Le Pere Marquette, one of the earliest, most intrepid, and accomplished of the Jesuit missionaries, met his death in May, 1675, and as it was too far to bear his body to Michilimackinac, which he had founded, they buried him near the bank of the river. Among the important discoveries made in this region by Marquette was that of the Mississippi river, which he entered in 1673 with Le Sieur Joliet. Of this fact of the discovery of the Mississippi river by Marquette there is now no doubt.

The vicinity of Le Grande and La Petite Traverse bays was also a favorite ground of the Indians. Nine miles below Little Traverse bay was the French mission of L' Arbre Crocke, and was also the location of a large Ottawa village. These Indians here resided in comfortable houses and cultivated the soil quite extensively, producing fields of corn and other crops. The location of this mission was thirty-three miles from Old Mackinac, opposite which latter, on the northern peninsula, was the mission of St. Ignace. The fathers who conducted these missions and endured the hardships of this remote wilderness, were in many instances recompensed for their zeal and fortitude with the loss of their lives at the hands of those whose welfare they sought to promote, frequently suffering the most cruel tortures. Pere Brebeuf, who had braved the dangers of the wilderness for twenty years, was burned alive with a co-laborer, Pere Lallamont, upon the shore of Lake Huron. The latter writing in 1640, said: "For bed we have nothing but a miserable piece of the bark of a tree; for nourishment, a handful of corn soaked in water; and after all, when we perform the ceremonies of our religion we are looked upon as sorcerers." Regarding success he states: "With respect to adult persons in good health there is but little apparent success; on the contrary, we meet only storms and whirlwinds." Many other Jesuits were likewise put to death by the Iroquois. The most important of the posts in this territory during the period prior to the commencement of the agricultural settlement of the country was at Mackinaw; this locality surpassing in beauty any other in the region of the upper lakes, has also been the theatre of some of the most interesting events in the history of the settlement of the Northwestern regions of our continent. In the business transactions, the standard of value was the beaver skin; other furs were reduced to a ratio of this standard. In 1765, according to Henry, the value of beaver at Mackinac was two shillings and sixpence per pound; other skins two shillings each, and so on. A stroud blanket cost ten beaver skins; a white blanket eight beaver skins; and a pound of powder two skins; a pound of shot or ball, one skin; a gun twenty skins, an axe two, and a knife one.

While Michigan was thus early traversed and missions and military posts were maintained within its borders for so long a period, very little or no change was otherwise made. Under the French government, the employments and profits of the fur trade afforded all the business that the people desired, and they gathered about their primitive settlements such amusements as sufficed for their social desires; the abundance of fish and game enabled them easily to provide the means of subsistence. The policy of the government did not tend to encourage immigration; too many restrictions were made in holding land. After passing to the English, the country progressed as little as with the French; individuals were forbidden from purchasing land of the savages, or from making settlement unless by permission of the crown. Accordingly, though held by foreign powers for so long a time, there were few vestiges of improvement or enterprise. And when down to a comparatively late period it came into possession of the United States, the difficulties of the new government were hardly adjusted, when the new war of 1812 broke out, and the Indians, with which the country swarmed, were incited to every degree of hostility and cruelty. After the close of this war, the peaceable relations which were finally established with the Indians, the abrogation of their claims to the soil, the liberal policy adopted by the United States government in the sale of its lands, began to promote the settlement of the country. The population of the territory in 1810 was but 4,762, in 1820 it had increased to 8,896, in 1830 to 31,639, and in 1840 to 212,267.

From the close of the war to 1831 Gen. Cass had remained governor of the territory, and it certainly was the good fortune of the country that its affairs were in the hands of so prudent and sagacious a ruler. He was experienced as a soldier, both in civilized and in Indian warfare, he understood the Indian character, acquainted himself with the wants and resources of the country, and applied himself diligently and successfully to secure its settlement and prosperity. Congress had declared that the land should not be taken from the Indians without their consent, and the treaties which had been made with them to extinguish their title to the lands were numberless. Much care and attention was necessarily given to this matter, as the Indians were jealous of their rights, and were prone to resist every attempt at an invasion of their domain until a purchase had been duly made. These perplexing claims of the Indians were gradually abrogated, and the survey of the lands which began in 1816 was prosecuted with diligence. The admirable system early devised and adopted by the general government for the survey of its lands is simply an application of the method of determining points by rectangular coördinates, the origin being the intersection of two lines run at right angles. One of these lines extending north and south is termed the principal meridian, the other projected at right angles to it is designated as the base line. The land is then surveyed out into townships of six miles square, each of which is designated by its number north or south, as the case may be, from the base line, and its number east or west from the principal meridian. The townships are then surveyed out into sections each a mile square. This is done by running the exterior lines and setting posts at the corners of each section and also midway between them, these lines crossing the section, connecting these latter points, divides each section into four equal parts termed quarter sections, and are designated by their position in the section. The quarter sections may be in the same manner subdivided and described. The sections are numbered from one to thirty-six, the numbers commencing at the northeast section and ending at the southeast. Nothing simpler or more effective for the purpose has ever been devised. In Michigan, which was mostly forest, the lines were indicated by blazed trees; posts were set at corners, and on the bodies of trees near each corner was branded a description of it, designating the number of the township and section, so that lands when surveyed could be found and examined and could be settled upon by the purchaser. The surveys in the southern part of the peninsula were made with reasonable care, but the northern portion, it has since been found, was generally only imperfectly surveyed.

The extension of these surveys bringing the lands into market, the completion of the Erie canal to Buffalo in 1825, affording complete water communication through the whole length of the State of New York and thus from the seaboard to Detroit, greatly increased immigration into the country. The first vessel larger than a canoe launched upon Lake Erie was in 1678, and the first steamboat in 1818.

The ordinance of 1787 provided that Michigan should be admitted into the Union when the population amounted to the number of sixty thousand. A canvass being taken in 1834, it was found that the territory had a population of eighty-seven thousand. Accordingly in May of the following year, a convention assembled in Detroit, which formed a constitution and sent it to Congress with the application for admission to the Union. Congress passed an act providing for the admission of Michigan as a State, but making its boundaries such that the southern limit should give to Ohio a strip of land about fifteen miles in width, bordering on both States. An act was passed by the State of Ohio, requiring a survey of the disputed boundary. Michigan retaliated by forbidding any trespass of the kind within her alleged dominions. The surveyors who attempted to re-mark the line, were driven from the ground, and subsequently a body of militia was drafted, and with the acting governor, Mr. Stevens T. Mason, at its head, was marched upon the disputed ground.

Owing to this feeling, the convention which assembled at Ann Arbor in September, 1836, refused to accept the conditions of Congress, although in lieu of the disputed strip, the territory known as the northern peninsula was added.

A third convention was called, which assembled in December of the same year, and decided to accept this condition which Congress had imposed. A strongly impelling motive to this action was to acquire admission to the Union, in order to participate in the division of the surplus revenue.

As the act of Congress did not provide for the action of the second convention, the President declined to issue his proclamation declaring Michigan a State, but submitted the matter to Congress. After a protracted discussion of the subject in that body, the question was finally decided in favor of admission.

Soon after the admission of Michigan as a State, a system of public improvements was inaugurated; among these was to provide for building what were known as the Michigan Southern, the Michigan Central, and the Northern railroads, and for building or making surveys for several canals; of these, was the St. Mary's ship canal; for surveying, improving, and making further navigable some of the important rivers of the State, for making a geological survey, and to lay the foundations of the University.

The topography of the State, in the condition of nature, was greatly diversified, and gave a most pleasing alternation of heavy timber, prairies, and oak openings; the conformation of the interior is generally rolling. The hills being disposed without order, the soil is exceedingly variable in character and value, but everywhere generally productive.

The products of the soil are those most esteemed in the markets of the world. Its climate is healthful and more equable than is found elsewhere in the same latitude in the United States.

The State abounds in small lakes of pure water, in all of which an abundance of fish was found. The streams and rivers are numerous and traverse every portion of the State.

The aggregate of valuable timber, black walnut and pine, etc., which but recently covered the soil of Michigan, was enormous. Already the lumber camps, crowded from the depleted forests of the southern peninsula, are transferring to the head waters of the Menominee and the Ontonagon, in the northern peninsula.

The lower peninsula is a drift formation, in which rocks of every variety are found, but seldom *in situ*; they belong to the drift, and are largely derived from the shores of Lake Superior. Pebbles, boulders, and masses of the granite, trap, sandstones, etc., which make up the rocks of the Lake Superior region, are everywhere found scattered on the surface, and mingled with the soil of the lower peninsula. But the rocks, which form the basis for this superstructure of drift, are horizontally bedded, and generally too deeply buried to admit of being examined.

The out-cropping rocks are sandstones, carbonates, and sulphate of lime. The former of which, as mainly found, are of a friable character, and too readily disintegrate on exposure to the atmosphere, yet in some places where it occurs, it possesses some economic value as a building stone. This rock has been more or less quarried in the counties of Jackson, Ingham, Shiawassee, Genesee, Eaton, Clinton, Ionia, Calhoun, and perhaps in others.

Underlying this sandstone is a limestone, which is frequently of a silicious character, but in some places makes an excellent quick lime.

Other sandstones, of a somewhat better quality, and underlying the former, occur at various points in lower Michigan, and to some extent are quarried and used for building.

Associated with these, and belonging to the same period, is the coal, which, in Michigan, so far as is known, makes a poor showing as compared with the coal beds in the adjoining States of Ohio and Indiana. Coal is mined in Jackson and Shiawassee counties from coal seams having a thickness of from three to four feet. It is found in many places in a radius of fifty miles, but nowhere in seams having a greater thickness than is found in the mines at Jackson. It occupies the central portion of the peninsula, and the highest elevation.

The extensive gypsum deposits in Kent county are largely worked, and elaborate works have been erected in the vicinity of Grand Rapids for converting the rock into land plaster and stucco. Gypsum is also found in quantity in Iosco county, bordering on Lake Huron, and at Alabaster, in that county, similar works to those in operation at Grand Rapids, only of less magnitude, are employed in preparing the crude material for market. But the chief mineral product of the lower peninsula is the salt. In the production of this important article Michigan surpasses any State in the Union. The brine is drawn from wells made by boring to a considerable depth.

The existence of salt springs in the peninsula was known to the Indians long prior to the advent of the white men in the country, and they were resorted to by both Indians and wild animals. Even the manufacture of salt from the brine of these springs was undertaken at several points at an early day. So well known was this fact of the presence of salt springs, that the general government made numerous reservations of lands, which were supposed to contain salt deposits. By the act of admission of Michigan into the Union, the State was authorized to select seventy-two sections of salt land, or lands where the presence of saline springs indicated the occurrence of salt deposits. On the organization of the geological survey, the State geologist, Dr. Douglas Houghton, made an examination, with the view to the selection of these lands, and in 1838 reported the results of his observations. Still these examinations were limited mainly to surface indications, and no extended experiments were for some time made to probe the coast far below the surface.

However borings were finally undertaken in several localities, resulting generally in such a good measure of success as to stimulate still further trial, developing such gratifying results, especially in the Saginaw valley, that in 1859 the first company was organized for the manufacture of salt, since which period this industry has reached to its present stupendous proportions, adding greatly to the wealth and reputation of the State and especially to the growth and development of the cities and the region in which this business is carried on.

The origin of these deposits is not known; whence the waters lying so far beneath the surface derive their saline property there is no apparent means of determining, nor is the boundary of the surface known beneath which these deposits of brine may be found. The Michigan salt group has a wide extent in the State, though thus far the salt industry has been confined exclusively to the Saginaw valley. Where the lowest horizon is found in the salt group the brine is found to be the strongest, greatest in amount, and best in quality. It is for this reason that salt wells in the Saginaw valley have proved to be more valuable than elsewhere. It is the region in which the greatest depression occurs. The salt group here lies at a depth reaching to more than a thousand feet below the surface of the lake. A well has just been bored at Jackson to a depth of 2,160 feet and a suitable brine has been reached for the manufacture of salt. At what depth below the surface of the lake this brine is found I am unable to state. Of one thing there is an apparent certainty,—that the supply of the brine is inexhaustible. The extent to which the manufacture of salt in this State may be carried is one of cost and demand. The brine may be assumed as existing in quantity far in excess of our ability to diminish it.

Of the two modes of securing the evaporation of the water, either by the application of solar or artificial heat, the latter is the method mainly resorted to in Saginaw. Solar evaporation is effected by exposing the brine in shallow wooden vats. Such vats as are used are eighteen feet square and six inches deep. It is supported on posts above the ground, and is provided with a roof which is readily moved on the vat or off from it to cover the brine from the rain or to expose it to the sun, as required. The process is begun in March and the contents removed in July, the product of the second filling is taken out the first of September, and the third and final removal occurs the last of October. The annual product of a single salt vat is fifty bushels.

A kettle block contains fifty or sixty kettles set close together and in rows enclosed in stone work or brick work. A launder connects with a cistern kept filled with brine and runs along between the rows of kettles, and from this launder the brine is drawn out into the kettles by opening a lateral spout. When seventy per cent of the water has been boiled away the salt is dipped out into a basket to allow the water to run out of it, after which it is emptied into a bin, where, after a sufficient time—about two weeks—it is ready to be put into barrels. But the greatest advance in the way of cheapening the cost of the salt production has been achieved by the use of steam to afford the heat for evaporation. For this purpose the exhaust steam of the great mills in the Saginaw region is used, and the fine sawdust, otherwise worthless, is utilized in creating steam for this purpose.

Pans are also made use of, a so-called pan block consisting of a "settler" pan, and packing-room enclosed in the same building. The brine is drawn from the settler into the pan, to the bottom of which the fire is directly applied, making the evaporation very rapid, and causing the salt to form continuously.

Great progress has been made in the salt manufacture in this State. The steam and pan processes have supplanted the kettles which were used earlier, and from costing $1.50 per barrel to make, salt is now produced at a cost of forty to fifty cents per barrel. The business has swollen from the manufacture in 1860 of 4,000 to 3,037,317 in 1882, and the total number of barrels made in the State during the twenty-two years is 24,652,985. In quality it is not surpassed by that produced anywhere for all domestic purposes.

Thus we have in lower Michigan two important minerals, which exist in quantity sufficient to be of much economic value, gypsum and salt. The coal miner are few, and under the circumstances in which they are worked, are not greatly profitable. Of deposits of the metallic oxides, save limited basins of bog ore, there are none. It has neither mountains nor ledges of primitive rocks. It is a region of agriculture *par excellence*, of fertile soil and genial clime, of oaken glades and stately forests, of smiling fields and pleasant homes, of thriving towns and active industry, of prosperity, health, intelligence, economy, and obedience to law; and yet Michigan is a great mining State.

In that portion of its territory included in its bounds by congress, as an offset for the strip of land on the borders of Ohio, has grown up a mining industry that is already of wonderful proportions. As this portion of the State was wholly separated by water from the main body, comparatively frigid and inaccessible, wild, inhospitable—a region of primitive rocks and impenetrable forests, —it is not surprising that time should elapse ere its riches were known, and that the early development of its resources should be slow.

At the time of the admission of Michigan as one of the States of the Union, very little information respecting the northern peninsula had been obtained beyond what was known to the early travelers. The country was too far removed from the marts of commerce and civilization to attract any particular attention. It had been run over, no doubt, by explorers hoping to find gold or silver, or other precious minerals. Specimens of native copper and ores of iron had been found in sufficient quantity to establish the belief that deposits in place of these metals existed in the country, but no systematic explorations had been made.

The early settlers in the new territory were too much occupied with the labor of carving out for themselves homes in the wilderness, to trouble themselves greatly about this far-off portion of the State.

Dr. Houghton, who had made an examination of lower Michigan, and published the results of his observations in 1838, thereafter extended his geological researches into the northern peninsula, and his official report, presented to the State in February, 1841, drew public attention anew to this region.

Dr. Houghton had determined the existence, in the rocks of that country, of deposits of native copper, and in his report the first knowledge of this fact was made known to the world.

Impressed with the importance and difficulty of the work, and the necessity of its speedy and thorough accomplishment, and knowing that the country must be surveyed before the land could be purchased, and results of his labors made to be of practical utility, and also as the State appropriation was too small to be of much avail for extended geological work in this distant region, Dr. Houghton devised the plan of uniting geological observations with the linear surveys, and succeeded in securing its adoption by the general government. He had previously tried this plan in his work in the lower peninsula, and became satisfied of its feasibility. Mr. Wm. A. Burt, who for many years had been engaged in the work of surveying in southern Michigan, had been induced by Dr. Houghton to collect specimens of rocks, and to make geological notes in connection with his work of running lines. The same had been done also by other surveyors, and these results had proved of much value in studying the geology of lower Michigan. Dr. Houghton himself took the contract for making the linear survey of the upper peninsula, and in addition to the usual requirements for such work his contract with the government specified that the surveyor should note all outcrops of rocks, their strike and dip, character, etc., and also collect specimens of them and return them properly labeled, with the notes. All other topographical notes, such as timber, soil, streams, lakes, hills, mountains, etc,, also the variation of the magnetic compass were noted. His idea was to connect the two surveys under the authority and direction of himself, and he would be thus enabled to systematize a great mass of facts. Mr. Burt. who thoroughly entered into the plans of Dr. Houghton, and was equally enthusiastic in the prosecution of the work, superintended the running of the township lines, while the running of the subdivision lines was allotted to competent and faithful deputies. Dr. Houghton's plan also provided for making barometrical observations along the surveyed lines. An increased compensation per mile was allowed by the government for the additional geological work. Mr. Burt carried his surveys from the the lower peninsula into the northern in the year 1840, and had progressed to some extent up to the spring of 1844, when Dr. Houghton's contract took effect.

On October 13 of the following year Dr. Houghton was unfortunately drowned off the mouth of Eagle river, while endeavoring to enter the harbor in an open boat in a storm. One cannot cease to regret that one so fitted for the accomplishment of the important work which he had undertaken should have met an untimely death.

The surveyor continued to make geological notes and to collect specimens, but there was no one to correlate and classify the facts and publish the events to the world. Many of these data, however, were placed upon the maps of the surveys and have thus afforded information which has proved of very great value.

By a succession of treaties between the United States and the Ottawas, Menominees, and Chippewas, the titles of the Indians to the lands of the upper peninsula, including Isle Royal, were finally extinguished in 1843. Shortly after this, numerous applications were made to the war department, by individuals, for permits to explore for minerals and to locate tracts of land in the district. In 1818 a law had been passed by Congress, authorizing private entries of this character in the lead district of Illinois, and in virtue of this act the secretary allowed similar claims to be made in Michigan. The grantee was required to make his selection within one year and to survey and mark the boundaries thereof, and to keep a person in charge of it, and to send to the department a description of his claim. The party was then entitled to a lease for three years, on condition that he pay to the government six per cent of all the metal produced, and if a renewal of the lease for another three years was obtained, he was to pay to the government ten per cent of the mineral raised. A further extension of three years was provided for, on the same terms. These grants were subject to any action which Congress might take in regard to the disposal of the lands. Applicants were at first allowed to select three miles square, but this was subsequently modified to one mile square. One thousand of these permits were issued by the war department and nine hundred and sixty selections were actually made, most of which were on the Keweenaw point, some in the Ontonagon district, and a few in the iron region, notably the Jackson, Cleveland, and Lake Superior locations, while later on the discovery of the iron ore deposits here, in the fall of 1844, by the United States surveyor, were secured by permits.

Congress having declared that the granting of these permits by the war department was without authority of law, in 1846 their further issue was suspended. In 1847 the Lake Superior land district was established, comprising all that portion of the State north of Saginaw bay and the Grand river, including the upper peninsula and the islands. In this act a geological survey was also provided for, and the president was authorized to offer for sale, by advertisement, such lands as were found to contain valuable minerals. The act further secured to parties all vested rights in lands held under permits from the war department. The land office was located at the Sault de Ste. Marie, and for a time there was much hurrying by rival claiments, in their endeavors to forestall each other in securing coveted lands. A journey from the iron range or copper range in those days to the Sault was a difficult undertaking, and not unattended with danger. At the time the government began to grant mining permits a mineral land agency was established at Copper Harbor in 1844. This agency was controlled by the war department, and was maintained for the purpose of protecting the government interests in the mineral lands of the country, and for receiving application for permits, entries, etc.

Subsequently the mineral lands were appraised by government agents at five dollars per acre. Still later the mineral lands were sold at the minimum price of one dollar and a quarter per acre. Before the lands in this region were brought into market, the permits of the war department were the only titles which people could obtain to lands, and they were naturally not unfrequently rated at a high value. At Copper Harbor, the seat of the government agency, a small stockade fort, Fort Wilkins, had been built, and being garrisoned by a company of Federal troops, it naturally became the rendezvous of explorers, and the starting point for all expeditions into the wilderness. As the copper bearing rocks are plainly exposed in this vicinity, and on examination readily exhibit indications of copper, the first locations were made here. Subsequently, in 1846, a branch agency was established at the mouth of the Ontonagon river, for the convenience of explorers in that portion of the range. Explorers were abundant. The field was new; it was uncertain what might be found, but all were stimulated in a high degree with enthusiasm and eagerness to find something. Search for mineral wealth has in all ages driven men to endure deprivations and danger that scarcely another motive could have sufficed to have impelled them to have met. To the impelling influence of this motive is due the settlement of remote portions of our own land. It guided the pioneer across the plains to California in '49. It has sent him to the mountains of Colorado, to the Black Hills of Dakota, and to the arid plains of Arizona. It has made populous States and territories, thriving towns and industry, where were otherwise unsettled and unknown territory. Lake Superior was the first of our great mining regions to which the steps of the explorer were directed; the first in which was indicated the aptitude of the American for such preliminary work. The fever of exploration in the copper range culminated in 1848, at the time of the completion of the United States linear surveys in that district, and in the following year began the great tide of pioneer emigration to the Pacific coast.

In 1849 the troops at Fort Wilkins were transferred to the seat of war in Mexico, and the government mineral land agent was removed to the Sault. In the meantime several mining companies had been organized and were successfully working. Copper Harbor was no longer the seat of the empire: its glories were already become of the past; the metropolis of the region was at the mouth of the Eagle river, in the vicinity of which were the Lake Superior, the Cliff, the Copper Falls, the Northwestern, and other mines.

The early efforts of the pioneer miners in this region were crowned with far less success than had been anticipated; their hopes were high and the results were small. The disappointment which had attended nearly all the mining work had created a good deal of discouragement. The discovery of the Cliff mines, the finding of masses of copper at the foot of the Greenstone bluff in that vein, in 1845, was the first inspiriting indication; it accounted for the origin of the erratic copper boulders that had from time immemorial been found in the country, and renewed the confidence and zeal of the people in the mineral value of the country.

In 1848 the villages in the copper region were Copper Harbor, Eagle Harbor, and Eagle River, the latter of which became the shire town of Houghton county. To Houghton county, which embraced the entire copper district, was also appended Marquette county. Other settlements in the upper peninsula were the villages of Mackinac and St. Marie, and the small settlements at L'Anse and at Marquette.

The first general mining law of the State was made in 1853; previous to that time the companies worked under special charters, or as partnership concerns, or were incorporated under the laws of other States. The Michigan general mining law was esteemed a very wise and liberal one, and the successive amendments, which have from time to time been made, have been such as experience has dictated.

The early explorations in the copper range were mainly in these portions where the rocks are exposed; where bluffs, gorges, and river channels afforded the best opportunities for rock examinations. Keweenaw Point, including Isle Royale and the Ontonagon district, embrace many localities of this description, and for some years exploration and mining work in the copper region was confined to these localities. No mines of much value were ever opened in Isle Royale, but in Ontonagon, as a result of much exploring, the Minesota mine was found in 1848, and as did the Cliff, at the other extremity of the range, it had an immediate effect in restoring confidence in the country. Up to the discovery of the Minesota mine, very little success had attended the efforts which had been made in this county, but the Minesota yielded masses of copper from the start; in fact it was the discovery of masses in the ancient workings which first served to indicate the lode. Previous to this, masses of copper had only been found in the fissure veins of Keweenaw Point. In Ontonagon, where are no copper bearing transverse fissure veins, native copper was first found to occur in lodes, which had the same strike and dip as the formation. Soon after the discovery of the Minesota, the National mine began its prosperous career, and stimulated by the success of these profitable mines, innumerable others sprang into existence, so that for a time Ontonagon county was the most prosperous portion of the upper peninsula. The village of Ontonagon grew into a town of importance, and became the metropolis of Lake Superior. But as few of the many mines that began working in that prosperous period proved profitable, the most of them were obliged to shut down, and with the wane of the Minesota and the National the fortunes of the county were obscured, and in later years the interests in that portion of the copper district have remained stagnant. Its resources, however, are varied and ample, and are sure to be developed at no distant day. In addition to the great extent of the copper range within its borders, which in the past has revealed such enormous riches as were afforded by the Minesota, the iron range in its southern limit is probably no less valuable. It is now certain that this Agogebic range, soon to be opened by railroad communication, will afford important iron mines. Its vast forests of pine and other timber will now be available. The Ontonagon, the largest of the streams flowing into Lake Superior from the south shore, reaches to the head waters of the Menominee, which empties into Lake Michigan, and of the Wisconsin whose waters flow to the Gulf of Mexico. This river, leading so far into the interior with its branches, affords the facilities for floating vast numbers of logs to its mouth, where they may be converted into lumber in the mills now erecting, and shipped in vessels to any market desired.

In addition to these Ontonagon county is an excellent country for the prosecution of successful agriculture. The soil is, much of it, first class, a strong, productive loam. It has proven good wherever it has been tried. It is a natural grass land and yields potatoes, cabbage, turnips, oats, and wheat abundantly. Heretofore it has been inaccessible in summer by any thoroughfare except by water, but within the past year a highway began some years ago has been completed to L'Anse, the western terminus of the Marquette, Houghton & Ontonagon railroad. And also the Ontonagon & Brulé River railroad has completed twenty miles of its line from the lake terminus at Ontonagon village to the old Minesota mine, and thence on. When completed and the M., H. & O. and other lines are extended to connect with it as now contemplated, and the road is built to the Agogebic range, the county will be provided with railroad facilities that must greatly facilitate the development of its resources. There is a tendency to revive some of its long dormant industries. Already the National has been freed of water. The old Bohemian, in the hands of a new company, has started on a new career; the Victoria is again undertaken. The operations at the Nonesuch are assuming extensive proportions, so that the outlook for the business of the county has greatly improved. In this county the mineral range is completely cut through by the Ontonagon river, as it is again in Houghton county by Portage lake and is partially also divided by the Flint Steel and by the Fire Steel rivers.

The villages in this county are Ontonagon, which is the county seat, Rockland which is on the range thirteen miles to the east, near the Minesota and National mines, and Maple Grove, five miles from the latter and near the Mass, Ridge, Bohemian, etc.

Keweenaw county comprises the greater portion of Keweenaw peninsula, the tongue of land that projects from near the center of the south shore far into the lake, once the leading copper district; it has been, like Ontonagon, for some years at a stand-still, but unlike Ontonagon it has fewer resources. Aside from its copper mines it has little to induce immigration or to support a population. It is really the extremity of this island into which the western portion of this singular peninsula has been converted since cutting the short canal which opened Portage lake into Superior. From the eastern extremity of the "Point" the formation trends west for a distance of twenty miles, when it trends southerly, having at the Cliff mine, thirty miles west from the eastern extremity, a direction of S. 45 W. This range maintains an elevation above the lake rising to a maximum of eight hundred feet. The distance from the summit to the lake to the north and to the west is from two to three miles, the slope being tolerably uniform. On the opposite side the break is abrupt, making a nearly perpendicular wall of greenstone of two hundred feet in hight for much of the extent. The dip of the formation is to the north and northwest, at an angle of 22° to 28°. The rock, which comprises this elevation, is a course trap or greenstone, and is crossed by fissure veins carrying copper. The fissures do not, however, so far as has been determined, carry copper in paying quantity in the Greenstone, but on either side of the Greenstone many of these veins have proved productive. In addition to the fissure veins, there are copper-bearing belts, which conform in direction and dip with the formation. The most prominent of these is an amygdaloidal bed lying north of the Greenstone, known as the ash bed, and the conglomerate belt immediately underlying the Greenstone, which latter is mined in by the Allouez company, and by the Conglomerate Mining Company. Further to the south and east is the Bohemian range, which extends from the extremity of the peninsula westerly, parallel with the former. Mt. Bohemian in this range, near Lac La Belle, rises to a hight of 864 feet.

Some mining was undertaken in this south range in an early day, by corporations known as the Alliance Mining Company, the Mendota, the Forsyth (on sec. 33, T. 57, 32), New York and Michigan (sec. 19, 56, 32), the Trap Rock Company (sec. 8, 57), etc., but none of them found indications sufficiently encouraging to induce them to continue the work. Between these ranges the soil is deeply covered with drift and is in many places swampy and wet, so that exploring is difficult and expensive, and while untold wealth may lie buried beneath the soil awaiting the fortunate discoverer, there are no surface indications to suggest where the treasure is likely to be found, so that this wide tract of country remains to the miner an unknown region. There is no reason to doubt but that the Amygdaloid and Conglomerate belts, which have proved so profitable in the Portage Lake district, extend also south of the Greenstone in Keweenaw county, and will be found to be, when in time their location shall be determined, also largely productive in copper. It is probable that the south Conglomerate, which crosses the main vein in the Central mine, is the Calumet and Hecla lode, but further proof may not substantiate this conjecture as a fact; the assumption now rests upon the position of the lode with reference to the Greenstone.

As to what may lie to the east of the Greenstone, except for a limited distance, nothing is known. Undoubtedly at some future time more extensive and systematic explorations will be undertaken and the result may be such as to bring back to Keweenaw county more than its former prosperity. The county is provided with good wagon roads connecting all the towns and mining locations with each other and with Calumet, the latter, the terminus of the Mineral Range narrow gauge railroad. The principal shipping point for the district is at Eagle Habor. The other lake ports are Copper Harbor and Eagle river. In the interior, at each of the mining locations, have grown villages of considerable size. Some of them, like the mines on which they depend for support, give evidence of a lack of prosperity.

The active mines in the county at the present time are the Conglomerate, Central, Copper Falls, Cliff, St. Clair, Phoenix, and Allouez. The soil is generally of good quality, and was originally heavily covered with timber, consisting of maple, birch, pine, etc. In the vicinity of the mining locations much of this timber has been burned, but over the greater portion of the county the timber still remains.

During the early days of mining operations in the Lake Superior country the region about Portage lake received but little attention; it was then not thought to be valuable. Mining work first began here in 1852, at the Isle Royale mine, and within the few succeeding years a number of other mines were opened and largely worked. The subsequent development has been such as to give the Portage Lake district greatly the ascendency, and render it not only the leading copper mining district of Lake Superior, but of the world. This district is divided by Portage lake, a deep water channel which crosses the range, and with the brief canal at the western extremity, extends wholly across the Keweenaw peninsula, making a passage way suitable for the transport of the largest vessels. The most successful mines are to the north of this channel; those to the south of it, while the first to be opened and worked, have never, with one exception, proved profitable. The active mines in this district are the Wolverine, Centennial, Calumet and Hecla, Osceola, Peninsula, Franklin, Pewabic, Quincy, and Hancock, on the north side; and the Grand Portage, Isle Royale, Huron, and Atlantic, on the south side. Of these, two only, the Calumet and Hecla and the Peninsula, are in conglomerate lodes; the others are amygdaloid. Work at these mines has been brought to a high degree of perfection; little that is old and obsolete in this industry is here apparent; all that experience and skill can devise in the way of improvement is speedily adopted. Progress is always in order at the leading Portage Lake mines, and not only do they keep up with the times, but are themselves in the vanguard, and are the leaders. Nowhere can one find better opportunities to acquaint himself with the advanced methods in mining work than here. The great stamp mills are marvels of perfection; the hoisting and pumping engines are of the most elaborate and powerful patterns; the compressors and power drills are the most effective kinds; the skip roads, automatic railways and gravity inclines work with well ordered safety and precision; and the underground openings are pushed forward with wonderful rapidity and economy.

The Portage Lake mines are in Houghton county, and have developed an unparalleled richness. In the county three thriving, important villages have grown up,—Houghton, Hancock and Calumet. The two former are situated upon either side of Portage lake, and are connected by a draw-bridge. They are provided with extended docks, which are constantly touched by vessels in the season of navigation.

Hancock, on the north side, is the seat of much industry, since it contains the extensive works of the Detroit and Lake Superior Copper Smelting Company, at which the larger portion of the product of the mines is smelted and prepared for market, also the stamp mills of the Osceola, Hancock, Quincy, Franklin, and Pewabic companies, a large planing mill, with sash, door, and blind factory, the Portage Lake foundry and machine shop, and other important manufactories.

Houghton is the county seat, and contains many elegant residences. The two towns, with their environs, are usually comprehended under the one name of Portage Lake, and is altogether one of the most active spots in the upper peninsula, and one of the most interesting and delightful as a resort.

The Mineral Range Railroad connects Hancock with Calumet, passing on the way the Peninsula and the Osceola mines. Calumet and Red Jacket constitute one and the same village, and combined contain a large population—about 6,000,—but it has little to commend it in the way of natural beauty or social charms. It is filled with a mining population, and the houses are mostly built for the occupation of miners. Lake Linden is the seat of the Calumet and Hecla company's stamp mill. It is four miles distant from Calumet, and is connected with the mine by a railroad owned and operated by the company. Here also is somewhat of a village.

Houghton county has much excellent farming land; the soil is uniformly good and much of it covered with fine hardwood timber, pine, etc.

It has been ascertained that everywhere in the copper range the deposits have been previously worked by ancient miners, by some race who preceded the Indians who occupied the country at the time of its discovery. At least the present race of Indians knew nothing of the existence of copper deposits or of mining, or made any practical use of such portions of copper as they found. This work of the ancient miners extended through a long period of time, as the evidence conclusively shows, and was participated in by large numbers of men. These ancient workings are, in some instances, of an extensive character, and they are indications that have been of great benefit to the modern explorer, and have led to many valuable discoveries.

Dr. Houghton had at first confined his examination to the copper range, and as there are no outcrops of iron in this range, nor on the lake shore along which he had frequently coasted, the discovery of the iron ore deposits was not made until the fall of 1844. Dr. Houghton and others believed that iron existed in places and in quantity in the country. Frequent specimens of iron ores had been found and commented on, but no deposits had actually been seen by those competent to recognize them and describe them.

The discovery is due to a party of United States surveyors, when engaged in running the west line of township 47, range 26. The northwest corner of this township is at Teal lake, and the line south in the first mile crosses through the present city of Negaunee, making also the east line of the Jackson mine; it was in running this line, on the 19th of September, when about a mile south of Teal lake, that remarkable variations in the magnetic needle,—facts which the surveyors were required to observe and record—were noticeable; attributing the cause of the phenomena to the presence of magnetic ore in considerable quantity, they sought for it and found outcrops of ore at several points, specimens of which were taken and preserved. It is related that Mr. Burt, who was chief of the party, was greatly elated at this illustration of the value of his solar compass, which was the instrument employed, the invention of which is due to himself. Early in the following season, while prosecuting the survey, other outcrops were found, particularly at what is now known as the Cascade range, where lean jaspery ores make an abundant showing.

The first location of iron lands was made in the summer of 1845, the year following the discovery, by using a "permit" applied to the same lands on which the discovery had been made, though it is not certain that any knowledge of this fact led the parties to make the application. This entry was made by Mr. P. M. Everett, who, with a party of four men, came to the country from Jackson, Mich. Messrs. S. T. Carr and E. S. Rockwell, members of Mr. Everett's party, were led to the spot by an Indian named Manjekijik, who described the outcrop as bright and shiny, leading the party to anticipate that the find would be gold or silver. Although the party was in search of mineral which, according to their notions was of more value than iron, they yet concluded to make sure of what they had found, and secured it with a "permit" granted to James Ganson. As only the township lines had been run, the party made their own survey as best they could, and described their location, which includes the present Jackson mine, by metes and bounds, making Teal lake the starting point. Subsequently, when the township was subdivided, the land was purchased of the government at $2.50 per acre. These permits were issued from the War Department and when locations were first taken the entries were made at the Mineral Agency at Copper Harbor. In their anxiety to get something, and knowing almost nothing of the country, these permits were frequently applied at haphazard, and the descriptions were very imperfect; generally the first entry was but temporary, the holder being allowed by the agent, on application, to lift it, as it was called, and apply the permit elsewhere. At the time of Mr. Everett's visit, in 1845, much of the country west of Dead river had been temporarily secured in this way. Mr. Everett's party had thus been anticipated by the application of a permit,—No. 158—granted to D. Hamilton, of Watervleit, N. Y., to section 1, T. 47, R. 27, thus covering the land which the Jackson party sought to secure. In the same manner sections 3 and 10 had been secured, on the former of which is the New York mine, and the latter the richest portion of the Cleveland and the Lake Superior mines. Subsequently these prior applications were withdrawn, and the Jackson men having got an accurate description of their location, held possession of it until the government survey was completed, when the final purchase was made. Thirteen men, residents of Jackson, Mich., had formed a company, which company they styled the Jackson Mining Company, appointing Mr. Everett secretary and treasurer. In the following year, four men of this company visited Lake Superior, for the purpose of making further examination of their iron location, and for the purpose of making further entries of land by using the permits, of which a number were still held by the company. On returning to Jackson this party took with them about two hundred pounds of ore, from which they succeded in making, in a blacksmith's forge, the first iron derived from Lake Superior ore. A mining company had been formed at Cleveland, and its agent, Dr. Cassels, when on his way to Lake Superior, met, at the Sault, Mr. A. V. Berry, the president of the Jackson Company. Dr. Cassels, through the advice of Mr. Berry, took the latter's canoe and an Indian guide, and proceeding to the Jackson location, he examined it, and also to the west of it, as he had planned to do when he left the Sault, and afterward secured this latter location with a permit. This entry became known as the Cleveland location, and was the subject of much subsequent controversy.

Mr. Fairchild Farrand, a member of the Jackson Company, explored the Jackson location, in the summer of 1846, and having mined some ore, and become satisfied of its quality, and that it existed in sufficient quantity, the company constructed the machinery for a forge, which they removed to Lake Superior, and erected on the Carp river, three miles from the mine, in the following year.

The first iron made on Lake Superior was in this forge, February 10, 1848. In a few days thereafter a freshet, caused by a sudden thaw, carried the dam away. In the summer thereafter Mr. Everett came up and rebuilt the dam, and the manufacture of blooms was resumed.

The forge was operated by different parties under leases from the company; but little iron was made and no money. The daily product was about three tons of iron, requiring two teams of six horses each to convey the iron over the intervening ten miles of execrable road to Marquette. These teams on returning brought back supplies for men and animals. Frequent mishaps and break-downs occurred, both at the forge and with the teams employed in transportation. Much difficulty also was experienced in procuring supplies of ore and charcoal. There was also an insufficient water power. The difficulties were too many and too serious for the maintenance of the concern, and resulted in its abandonment in 1856.

The Jackson Mining Company having been incorporated in 1848, and changed in 1849 to the Jackson Iron Company, its shares were bought up in sufficient amount to secure a controlling interest by General Curtis of Sharon, Pa., who owned and operated extensive iron works at that place. General Curtis conceived the idea that the future market for Lake Superior ore would be at the coal fields of Pennsylvania and Ohio. He took about seventy tons of ore to Sharon, where it was made into pig iron as a test, and it was pronounced excellent. The iron business on Lake Superior had developed but little, and was far from prosperous prior to 1860; after which time the great demand for iron, occasioned by the exigences of the war, caused the iron interests in this region for the first time to assume a successful aspect. The Jackson, being the oldest and among the best developed of the iron mines, was naturally among the first to feel the new impetus. The company paid its first dividend to its stockholders in 1862.

The Cleveland location was visited, as before stated, at about the same time as the Jackson, and was equally well known. The large outcrop now known as Jasper Knob, was thought to be a mountain of ore, and the high estimation in which the location was held, was based, largely, upon the appearances readily observable at this point. Possession was first taken of this property by Dr. J. Lang Cassels, in 1846, for the Dead River Silver & Copper Mining Co., of Cleveland, O., under an understanding with Mr. Berry of Jackson, who made the location known to him, that they should coöperate together in watching and holding them both. Subsequently, in the following year, Dr. Cassels returned to Cleveland. The land was entered upon by other parties, who asserted ownership. Out of this grew conflicting claims, whence a long controversy arose as to who should possess the land. As finally adjusted, priority of right to purchase was accorded by the land office department at Washington, to the Cleveland company. The Cleveland association was formed in 1849, but did no mining work until 1853, when it purchased the property belonging to what was known as the Marquette Company. This latter company represented one of the unsuccessful claimants to the Cleveland mine, and had built a forge in 1849, for the purpose of manufacturing blooms, starting with ten fires. After the merging of the company's interests into those of the Cleveland, the operation of this forge was continued by the latter company, using the ore of the Cleveland mine, as had been previously done. The manufacture of blooms at all the forges ever started in this district proved financially unprofitable; transportation was too difficult and expensive, there being no railroads, or scarcely wagon roads, in the country; no canal at the Sault; no docks at the harbor; no regular communication anywhere. Labor, especially skilled labor, was difficult to be got; and machinery must be waited for from "below," and returned there for repairs.

This forge of the Marquette company was destroyed by fire in 1854, and in the same year the Cleveland company made the first shipment of ore from this country, consisting of 1,449 tons.

Involved in the same controversy regarding ownership, was also what has since been known as the Lake Superior mine. The land was purchased by John Burt, at a great land sale held at the Sault in November, 1850. Burt leased an undivided one-half interest to Robert Graveraet, by whom it was assigned to the Marquette company, as an offset to cash capital paid in by other parties. It passed, with the other assets, to the Cleveland company in 1853, and was subsequently sold for the sum of $30,000 to the Lake Superior Iron Company. Ore had been mined from this location, to be used in the Marquette forge, previous to the organization of the Lake Superior Company, which latter was consummated in 1853. The land in which the mines are contained is the same as that purchased by John Burt, and comprised one hundred and twenty acres in sections nine and ten, township forty-seven north, and range twenty-seven west. The first shipment of ore was made in 1858, comprising 4,658 tons. The aggregate of the annual shipment from its mines now exceeds that of any other company in the district.

These three iron mines, the Jackson, Cleveland, and Lake Superior, the oldest in the district, still continue to be among the most important. During the thirty years in which they have been worked they have contributed to the markets an aggregate amount of 7,748,532 tons of ore, and so far from exhausting them, the work has developed a capacity for an indefinite continuance of their enormous annual output.

Two important enterprises, essential to the establishment and success of the iron mining industry on Lake Superior, were early undertaken and consummated. These were the building of a railroad from the mines to the harbor at Marquette and constructing the canal around the Sault de Ste. Marie. It was early seen by those who became interested in the mines that without these facilities for transportation the ore would be practically valueless, since it would not be got to market. It became apparent that the ore must be taken to the coal fields of Ohio and Pennsylvania to be economically made into iron. At first a plank road was made to the lake.

In 1853 Mr. H. B. Ely made a contract with the iron mining companies and undertook the construction of the railroad. The work did not progress very rapidly, some controversy arose with the mining companies, who built a tram road in opposition, but in 1855 these differences were adjusted, and the company was incorporated under a general railroad law, which had been recently passed. Sufficient capital was secured, and the enterprise pushed forward to completion the road being put in operation in 1857. This railroad is now a part of the Marquette, Houghton and Ontonagon line. which now reaches from Marquette, to L'Anse, soon to extend to Houghton.

The other important work mentioned—the ship canal at the Sault,—affected not only the iron industry but every other tributary to Lake Superior. Previous to the construction of the canal everything had to be reshipped that passed above or below the rapids.

To overcome this obstruction, Congress granted to the State of Michigan 750,000 acres of land, by an act approved August 26th, 1852, to be used to pay for the construction of a ship canal around the falls. The State Legislature accepted the grant, and authorized the Governor to appoint commissioners to contract for the work and to enter the lands authorized under the grant. In consideration of becoming possessed of the entire body of lands donated for the purpose by the State, the work of constructing the canal was undertaken by a number of eastern capitalists, and the first ground was broken on the 4th of June, 1853. The supervision of the work was placed in charge of Mr. Chas. T. Harvey, and its prosecution was attended with considerable difficulty; but the canal was finally completed and opened to the public in June, 1855, two years from the date at which the work was begun.

It soon proved inadequate to the wants of commerce, and its enlargement was undertaken by the general government, and carried on through many years, until this great and important work was finally completed in 1881. It now has a capacity sufficient for vessels of the largest size that can traverse the lakes. The locks are double, eighty feet wide, four hundred and fifty feet in length, and will float vessels drawing sixteen feet of water.

Since 1864, a large portion of the ore has found its way to Lake Michigan over the railroad, which was completed to Escanaba, a distance of sixty-two miles, in that year. This line, by consolidation with the Chicago & Northwestern Railway Company became known as the Peninsula branch of that corporation. A large ore dock was built by the Railroad Company at Escanaba, and recently the company has added a second, to meet the requirements of the greatly increased ore trade. The Chicago & Northwestern extended its line from the city of Green Bay, Wis., to Menominee, and in 1872 filled in the gap between that place and Escanaba, thus opening a complete railroad communication from the iron region to Chicago. Previous to this time egress from the country, or ingress to it, was very difficult at the seasons of the year when navigation was closed; and at times the conditions were such as to render such a journey utterly impracticable. The completion of this important line has effected great changes, as may be naturally inferred, in the Lake Superior country; the population and the business greatly increased.

In the same year in which this link was inserted that completed the chain connecting with the outside world, another important railroad extension was made by the Houghton & Ontonagon Railroad Company, which completed its line from Champion to L'Anse at the head of Keweenaw Bay. This road was shortly, previous to its completion, consolidated with the Marquette and Ontonagon, a company that owned the line from the mines to Marquette, and the consolidated company become known as the Marquette, Houghton & Ontonagon Railroad Company, controlling the entire line from Marquette to L'Anse. At this latter place the company, in anticipation of ore shipments from the new mines in the vicinity of Lake Michigamme, constructed an ore dock, at which a small amount of ore has since, yearly, been handled. At the present time this company—the M., H. & O.,—is engaged in grading a further extension of its line to Houghton, a distance of thirty-five miles north from its present terminus. It is expected that the road will be completed during this present year, 1883, and henceforth bring the metropolis of the copper region into railroad connection with the outside world—five hundred miles by rail to Chicago. Houghton and Hancock are connected with Calumet, thirteen miles to the north, by the narrow-gauge line, known as the Mineral Range Railroad. There are several short railroads in the copper country, all of which, except the Mineral Range road, are owned by copper companies, and were built and are operated almost exclusively for the purpose of conveying rock from the mines to the stamp mills. Of these the largest is the one now building by the Conglomerate Mining Company, which will extend from the mine to Lac La Belle, seven miles. The other on the Calumet & Hecla company's road, reaching from the mine to Lake Linden, four miles; the Atlantic company's road, three and one-half miles long; the Allouez mine road, two and one-half miles long, and the short tracks operated with locomotive, which connect the mines with inclines at the Pewabic and Franklin mines.

For many years railroad extension to Houghton and to Ontonagon has been contemplated, and liberal grants of lands were made for the purpose; the former project is about to be consummated, but the latter yet remains in embryo. There is a valuable grant of public lands offered by the government, which the railroad company much desires to possess, but there is as yet too little prospect of business in Ontonagon county to support a railroad from it to the east.

The county, however, is not wholly without a railroad. The Ontonagon & Brulé River Railroad Company, organized in 1880 to earn a valuable grant of lands conferred by the general government for building a railroad from the harbor of Ontonagon to the Wisconsin State line, completed from the first named terminus, eastward and southerly, twenty miles of its line during the first year, and has since remained idle, awaiting, it is said, the settlement of conflicting claims to portions of the land grant. It has been declared that this road will be completed during the present year, and will be met at the State line by the Wisconsin & Northern, with which it will be consolidated, and form one line from Ontonagon to Milwaukee. A bill has also been introduced into the Michigan Legislature to allow the M., H. & O. Co. to build from some point on its own line, east of L'Anse, to connect with the O. & B. R. R. at some point greatly south of its heretofore contemplated line.

It is also announced that the Wisconsin Central Railroad Company will build and operate a branch from Ashland, Wis., to the Agogebic iron range, the coming summer. A fact which gives credence to the report is the purchase recently made by this company of certain valuable iron leases in the Agogebic district.

The building of a railroad from Marquette to the Straits of Mackinaw was an object that it was sought for many years to consummate. This important work, so long desired, was finally brought to a completion in the beginning of the past year. The upper peninsnla was thenceforward placed in railroad communication with the lower, and the east, without passing beyond the borders of the State. There are many advantages to flow from the operating of this road, extending, as it does, for a hundred and fifty miles through the wilderness. It brings the lands and timber into market, and opens the country to settlement.

The Chicago and Northwestern Company has shown much enterprise and liberality in extending and operating its lines in this country, and has contributed greatly to the development of the iron district. A few years ago, when the fact was assured that merchantable ore existed in quantity on the Menominee range, the Northwestern built the Menominee branch to the new mining locations, thus affording an outlet to this new mining district. Since this time, as rapidly as new discoveries of ore deposits have been made in this range, the Northwestern, with great liberality and enterprise, has built branches to them. The company has, apparently, "never hesitated to secure to every new mine, as rapidly as possible, a branch railroad;" thus enabling these incipient enterprises to begin the shipment of ore almost with the advent of their mining operations, and thereby, through the sale of the product, securing the funds to open the mine.

During the past year the extension of the line has been completed from Florence to Crystal Falls, a distance of twenty miles, and connected at or near this terminus, by short branches, with a number of new mines that have been opened in this vicinity. Surveyors are at work locating the line for a still further extension of the main branch to Lake Chicagon.

From Iron River Junction, a station between Florence and Crystal Falls, a branch has also been built to Iron river, a distance of about fifteen miles. In the vicinity of this terminus are some very promising new mines from which a few shipments of ore were made as soon as the road was completed.

Another important branch to the Peninsula division of the Chicago & Northwestern was completed in the fall of last year (October, 1882), which starts from the main line, north of the Menominee Junction and extends northwesterly about twenty-five miles, to the Felch mountain iron range, where already developments had been made that give indication of much future prosperity.

Each of these new railroad branches has penetrated a region, which, aside from its mineral value possesses a most excellent soil for farming, covered with a most luxuriant and stalwart growth of the finest hard wood and other timber.

The Menominee iron range affords a remarkable instance of rapid development. The first iron ore, amounting to about 10,000 tons, was shipped in 1877, which in the brief space of six years increased to a yearly shipment of 1,000,000 tons. In this short period of half a dozen years, it has advanced from an almost unbroken wilderness to a region of extraordinary activity and prosperity; containing many busy, thriving villages, and numerous rich and productive mines. Without the aid of the railroad this success could not, of course, have been achieved. The existence of the ore being assured, the next most important element in the problem was the railroad. The following passage which I penned ten years ago, in writing of the Lake Superior country, is equally applicable in the present consideration: "The development of the mineral resources of a country are so intimately blended with the improvement of its facilities for transportation, as to render it essential, in considering the progress of the former, to give due credit to the latter. Iron ores having, comparatively to other metals, a low value per ton, must be reached by rail or by water, or better, by water and rail, before their value can be realized; differing in this particular from the ores of the precious metals, which will bear wagon or even pack-mule transportation. Especially is this true with reference to a region like the upper peninsula, which was formerly so isolated, and is as yet comparatively a wilderness." Time was required to establish the extent and the quality of its ores, and in an early day, without railroads, and with an obstructed water communication even, the progress was naturally slow. All improvement in this country has been unusually costly; it required so long a traverse to reach it; there was a rigorous climate, an unbroken wilderness, a small population, and the portions of the territory in which the mines were discovered were so rocky and rough as to render the construction of railroads a matter of much difficulty and expense. But the readiness with which the Northwestern has extended its branches to the newly discovered iron mines, in the last few years, illustrates the great change that has transpired since the industries of this remarkable region first began to be opened up to the world.

The upper peninsula is now no longer an isolated, dependent region. It is accessible by numerous lines of boats in summer, which enter its harbors, and and by two railway thoroughfares, which at all seasons of the year give rapid and complete communication with the east. Its position as a mining region is established, and the reputation of its great mines is world-wide. It is a region of great present prosperity, and of still greater possibilities. It has good society, numerous and well conducted schools, thriving towns, an intelligent representative press, and an industrious, law-abiding population.

Its mining resources are permanent, and anon, in the future, must be added thereto a diversity of other interests, for the establishment and conduct of which there is every inducement and encouragement. Agriculture is already obtaining a permanent foothold, and may be indefinitely extended, and is sure of becoming here a prominent industry. The few manufacturing undertakings which have been started are sure to increase in magnitude, and to afford the stimulus and example that shall lead to the inauguration of others.

But the great basis of all prosperity in this region must ever be its minerals. As a mining region it has extraordinary resources; its copper and iron are phenomenally rich and pure, and the deposits extensive. The mines are contiguous with Lake Superior, and thus possess cheap water communication with the world. It has an abundance of timber; is an elevated and remarkably healthy region, with pure air and pure water.

However deeply the mines may penetrate into the earth there is little cause to apprehend that there may be an excess of heat or a want of ventilation. By a proper arrangement of the underground workings the pure air which rests over the surface of the great lake will penetrate to the lowest depths, and the smoke and vitiated atmosphere will as readily circulate upward to the surface.

To reiterate a statement which I have made in a previous report—"This northern peninsula of Michigan, from its great extent of coast line of navigable waters, from its accessibility and the ease with which it may be reached and traversed, from the plentifulness and purity of its waters, from the coolness and salubrity of its climate, from the extraordinary richness, extent, and variety of its mineral deposits, stands preëminent among the mining regions of the earth. Its deposits of copper and of iron are nowhere surpassed, nowhere equaled, and from no other region can those minerals with less difficulty or greater economy be mined and transported to the markets of the world."

COPPER MINES.

7

COPPER MINES.

Before taking up the copper mines in detail and describing them in order some preliminary facts regarding the copper mining industries may not be without general interest:

It is gratifying to note that the copper industry is in a fairly prosperous condition, and that the remarkable depression which unfortunately prevails in the iron business has as yet left the copper mines comparatively unaffected. Considerable uneasiness, however, prevails among those who are entrusted with the management of this interest regarding the future. The apprehension is entertained that the general dullness which prevails throughout the country, together with the greatly increased production of ingot copper, may so far affect the market value of that article as to reduce it below the price at which it can be mined. It must be borne in mind that, leaving out the Calumet & Hecla, the profits in copper mining on Lake Superior are, on the average, very moderate. With most of the companies that are operating mines, it is a constant struggle for existence; by the closest economy they are just able to make ends meet, and a few of them are hardly so fortunate as to achieve even this not over-ambitious result, but find it not infrequently necessary to call upon the anxious shareholders for funds to continue the work. Out of the twenty-six copper mines now working on company account on Lake Superior, only five paid dividends in 1882, and these returned in this manner to their stockholders the sum of $2,780,000. Two millions of this was paid by the Calumet & Hecla alone, $440,000 by the Quincy, $200,000 by the Osceola, $80,000 by the Atlantic, and $60,000 by the Central. Some of the others made money which was used in increasing the mining plant, pushing the openings, or expended in such a way as should afford greater facilities for future working. The Calumet & Hecla pays annually a dividend of $20 per share, which is not excessive when we consider the market value of the stock—about $250 per share—since it affords to the investor only about eight per cent for his money—scarcely more than is demanded in the west on good real estate security. To be sure, to the original holders it represents a large profit; to those who may have been fortunate enough to buy when the stock was low, the advance is a great gain; but there is generally considerable risk which the original owners take upon themselves in opening and equipping a mine—as witness the Conglomerate, which has called, in two years, $900,000 of its capital stock, all to be expended, together with the avails of the copper produced, in preparatory work—that is, in opening a mine and in providing the plant to work it. No one now-a-days expects to open a copper mine on Lake Superior without a large preliminary expenditure of capital. It is frequently only by a large outlay that they can hope to succeed at all. The less the amount of copper contained in the rock, the more of the rock must be mined and stamped, in order to secure a product that shall insure the requisite income. A copper-bearing lode that yields only twenty pounds or less of ingot copper to the ton of rock must be so worked that the cost of obtaining this twenty or less pounds shall at least not exceed the market value of the copper. But this difficult problem is successfully solved. It is wonderful how thoroughly every factor which enters into it is considered and its exact relation to the other elements understood and defined. Probably nowhere in the world is mining work in advance of that done in the copper region of Lake Superior. Its history is a history of progress. There has been no halting, no retrograde, but a constant advance. No improvement is lost sight of, every advantage is seized upon and rendered available, every appliance brought into requisition and turned to the best account. The crude methods of early days have been discarded and the leading mines of this district are in the vanguard of the world's mining industry. Comment is unnecessary when we consider that mining work is so conducted, as in the case of the Atlantic, that a deposit which yields only fourteen pounds of copper to the ton of rock is made to defray all the expenditure connected therewith and in addition, year after year, affords to the stockholders a surplus of $2 a share—$80,000. This result is accomplished by daily mining and working up in the stamp mill 630 tons of rock, and doing it at what would appear, were it not an accomplished fact, an incredibly low cost. Or the equally remarkable results achieved at the Osceola, working a more difficult and far less regular lode, that yielded the last year only 24 21-100 pounds of copper to the ton of rock, and burdened with an excessive cost for transportation of the rock from the mine to the stamp mill of 30 cents per ton, was still able to meet all the difficulties and great cost, and pay to the stockholders a dividend of $5 per share—$200,000—out of the surplus, and to bring the mines at the end of the year in better condition for future stoping than it had ever been before.

The confidence and boldness with which mining work is undertaken, and the rapidity and success with which it is accomplished is illustrated in the recent enterprise begun by the Tamarack company. One year ago this company began the sinking of a downright shaft, which must extend, before its ultimate purpose is accomplished, more than two thousand feet vertically into the earth. This final object is to reach the Calumet & Hecla conglomerate. From a careful study of the inclinations of the copper bearing portions of this extraordinary lode, it is reasonably conjectured that beneath the surface of the land of the Tamarack company it possesses a degree of richness that should amply compensate for all expenditure and risk incurred in the effort to reach it. Imbued with this faith the company does not hesitate in the endeavor to accomplish it, and so well have they succeeded in the vigorous prosecution of the work under the direction of Captain Daniells, that the shaft has already attained to the depth of 550 from the surface. In the meantime, also, all the necessary plans for the completion of the undertaking have been permanently placed upon the ground. It is probable that ere another year shall have elapsed the shaft will have penetrated to a depth of 1200 feet, unless, as may possibly occur, the work of sinking shall for a time be suspended for the purpose of drifting and mining in the Allouez lode, should that deposit, as it is anticipated it may be, prove rich enough when reached, to justify so doing. In addition to the satisfactory progress made in the work, the company has met with much to incite agreeable anticipations in the encouraging nature of the ground which has been passed through. In an unusual degree it has proved copper-bearing; and one of these adventitious amygdaloid belts, that has been recently cut, proved so alluring, that the company were nearly persuaded to linger on the way, and further explore this newly discovered treasure house, which appeared to have hidden in its folds such a store of coveted riches. But resisting the temptation to tarry, but briefly, the work of sinking has gone almost uninterruptedly forward, and will not again pause until the Allouez conglomerate is reached.

In the early days of copper mining in this peninsula, such an undertaking as the Tamarack would scarcely have been thought of, or would have been possible to have succeeded. But all that has been changed; there is a new order of things. The power drill—"Yankee miner," as the Cornishmen designate it—high explosives, the Ball's stamp head, and the many other invaluable improvements that have been made, have resulted in revolutionizing the mining industry, and in giving it an immense stride forward. It is now only necessary to ascertain what must be and, presto, it is undertaken and accomplished.

Formerly it would not have been possible to have worked stamp deposits like the Atlantic and Osceola with any hope of a profit; but now, with the increase of knowledge and appliances, such lodes, in the majority of instances, form the basis of all that it is expected to accomplish; great richness is not hoped for; they only require, as far as can be ascertained, a certainty of the extent and quality of the deposit, so that knowing what is possessed the problem of working resolves itself into what must be done in order to leave a small margin of profit.

The great mines which early established the reputation of the Lake Superior copper district, the Cliff, Minesota, National, were all mass mines, and the enormous profits which accrued resulted from the constant occurrence of immense masses of native copper, requiring on the part of the companies to obtain the product, mainly the labor of cutting them up and hoisting them to surface. These mines paid almost from the start. The masses were found near the surface, and for years continued to occur in great quantity.

The funds necessary for opening and equipping them were derived from the mines themselves, with but a very limited call upon the stockholders. Once so productive and profitable, they became apparently exhausted and practically idle. Of the scores of mines that were working during the days of the Minesota and the Cliff, some of them extensively, one can count on his fingers all that have made any returns to the owners; and in but four has this return been greater than the original outlay.

The arguments which were used to convince capitalists of the value of mining shares and properties which were offered for sale, were invariably embellished with statements of the profitable results obtained at the Minesota and Cliff, and the inference not unfrequently made that like returns might be expected. But while failure resulted from the operations of nearly all of these locations, the profits afforded by the two mines claimed as representative, demonstrated the great worth of at least a portion of the cupiferous deposits of the country; and this knowledge not only sustained the flagging hopes of many a forlorn mining enterprise, and stimulated to renewed endeavor to achieve success, at many less promising mines, but also led to much extravagance in working, and, no doubt, to not a little deception in recommending stocks and properties for sale.

It was so easy for an interested party to refer to the Minesota or the Cliff, and endeavor to pursuade himself or others that another property had equal merit, just as now-a-days we so frequently hear of comparison being made of mining property with the Calumet & Hecla. Persons who have property to sell, newspaper men describing the country, and free trade writers and orators in discussing the copper mining industry, almost invariably draw their illustrations and comparisons from the Calumet & Hecla. It is taken as the representative mine, when in fact it is not; it is the exception, rather. It so greatly exceeds all others in the richness of the lode that there is no mine to be compared with it in product or in profit. In all estimates and considerations applicable to copper mining on Lake Superior, this company should be excepted. Its experience is for its own instruction, and is of comparatively little value to other companies. No other company could undertake a tithe of its expenditure and survive. It "so far overshadows all other mines in the copper district, in its expenditures, in its receipts, in the richness of lode, in the output of copper, and greatness of its profits, that there is no comparison to be made between it and the other mines." "A course of operations and expenditures that would speedily swamp any other mine on the lake can be undertaken by the Calumet & Hecla without the least concern; its profits will be sure to meet all costs and still have enough for enormous dividends." The following, extracted from what I have previously written regarding this mine, as is also a portion of what has just preceded, illustrates the position of the mine in this connection: "Of the 27,287¼ tons of ingot copper produced in the mines of Michigan in 1881, 15,680½ tons were the product of this one mine alone, and of the aggregate amount of 328,341 tons obtained from all the mines since the advent of the industry in this country up to the same year, 142,239 tons have been obtained from the Calumet & Hecla in a period of fourteen years."

"Of the $2,780,000 dividends paid to stockholders by Lake Superior copper mines in the past year, $2,000,000 were paid by this company alone."

"And of the total dividends paid by Lake Superior copper companies to December 31, 1882, amounting to an aggregate of $35,150,915, more than two-thirds, or $23,350,000, have been paid by this single company, and that within the brief period over which its operations extend."

"The Calumet & Hecla is one of the world's mining phenonema. There is no other such a uniformly rich copper deposit known."

"The other Lake Superior companies, by the best of management and the closest economy, can just manage to exist. Some of them, more fortunate, congratulate themselves on being able to make, annually, a moderate dividend. But this great mine need take no thought of economy; in fact, as compared with its neighbor, the Osceola, it apparently does not." "It regularly ships its thousands of tons product, and returns as regularly to its stockholders its millions in dividends." Rich in the present, and reasonably assured of its future, it is no wonder its shares are a coveted possession."

It is not for the purpose of booming up the C. & H. that these remarks are introduced, but considerable has been lately written in the papers and said in Congress on the tariff question in connection with the copper interest, and the results from this mine have been taken as the basis of the discussion. I wish only to show how little can be predicated upon such results that shall be applicable to other companies. Copper mining in this range, when properly undertaken and conducted, should be fairly remunerative. The deposits are better understood than formerly, and the experience and appliances for working them economically are at hand. There are failures still, and there will continue to be such; but they ought to be few. And generally while there should be a reasonable assurance of a moderate success in legitimate mining, it is better not to look too confidently for a Calumet & Hecla, and not to predict the payment of dividends too soon after the commencement of operations. In copper mining, as in every other industry, the excessive gains are the exception; the average of the mineral obtained costs all that it is worth. But there is that element of risk and so-called chance in the business of mining that inclines the average investor to take rather the optimist than the sober view of the undertaking. They may know that hundreds of shafts have been sunk which, unfortunately, became receptacles for burying treasure, where one has proved an avenue through which it has flown out; but the hope is sustained by faith in what may be hidden from view. Our hope is to be among the exceptions. The few rich veins which have been found establishes the fact that such do exist, and it is the expectation of discovering such a store of wealth that stimulates to ever renewed search and expenditure.

The copper mines were never in better condition than now. They are more extensively opened and show larger and richer stopes than were generally to be seen a year ago. If the price of copper is maintained at the point which it has lately held, a reasonably prosperous year may be looked for in the copper mines; but any considerable reduction in the market value of copper must result disastrously, if long continued, to many of the companies now operating.

THE KEWEENAW DISTRICT.

AND A GENERAL OUTLINE OF SOME OF THE CHARACTERISTIC FEATURES OF COPPER MINING.

In writing of the copper region of Lake Superior, if we follow the chronological order of events, we must begin with the Keweenaw peninsula, for it was here that the first explorations were made and the first mining work in the country was done.

The copper region is divided, geographically, into the three counties of Keweenaw, Houghton, and Ontonagon, and to them must be also added the island and county of Isle Royal.

This division is further borne out and sustained by the characteristic features of the metalliferous deposits which are found in the respective portions of the mineral range, embraced in the limits of those counties.

Commencing, as did the early explorers, with Keweenaw Point, we find that it has strongly marked geological features; in fact it was, no doubt, due to this prominence which its peculiar geological conformation gives to it, and to the general accessibility of this portion of the range that it was thus the earliest to attract public attention and the first in the region to witness the efforts of the modern miner, and to announce to the world the earliest definite intelligence respecting our great mineral wealth.

Its length is between thirty and forty miles and its breadth two or three miles. There are in fact two well defined ranges known as the Greenstone and the Southern or Bohemian range. It is in the former that are found all the prominent mines of the district and from which all the copper has been obtained.

These mines are of two classes, those in fissure veins and those working in amygdaloid and in conglomerate beds.

The fissure veins in this portion of the range cross the formation, usually at an inclination approaching a right angle and dipping nearly or quite vertically;

they vary in width from a few inches to several feet, sometimes, in very productive portions, widening out to even 12 feet or more. It is in these wide pockets that the greater portion of the copper is found; the extreme narrow portions of the vein serve only as leaders to guide in the work of excavating; the gangue of these veins is made up of quartz, calcite, prehnite, epidote, laumonite, dathotite; quartz and calcareous spar are usually the predominating minerals. The rock in the richest metalliferous portions is a rather soft amygdaloid trap of a fine texture.

These veins can be traced through the greenstone and have been found to be productive on both sides of it, but never in it. The other class of deposits which are mined in this district are the belts or beds, which run with the formation; the most prominent of these are the amygdaloid bed lying north of the greenstone and known as the Ash bed, and the conglomerate belt underlying the greenstone, and hence south of it. The former is a belt of soft amygdaloid, dipping to the north and northwest at an angle of 22½ to 28 degrees from the horizon and having a width of from 6 to 12 feet. It carries copper pretty generally through all portions of it, but in a very limited quantity, no portion of it having yet been mined that afforded a greater percentage, as an average result of any considerable portion of the rock, than one per cent of copper. To obtain the copper in this bed, as also in the conglomerate, the rock must be treated in the stamp mill; first crushed under the stamp heads and the sand run over the jigs and sieves, by which a mechanical separation of the copper from the sand is effected.

The product obtained from the veins is very largely in masses of native copper, or in pieces of a size termed barrel work. These veins sometimes contain more or less of the trap rock, in small pieces, to fragments of considerable size cemented together with the vein matter.

The conglomerate belt, in which several mines are now working, immediately underlies the greenstone and has, at the eastern portion of the range, a width of 25 to 30 feet, becoming narrower, until at the Cliff mine it disappears, but again reäppearing at the south line of the county, where it has as great a width as anywhere observed. It lies very flat, 22 to 30 degrees dip. South of the conglomerate the formation is made up largely of a series of amygdaloid beds, that occur as far as the ground has been explored in this direction. This ground, however, to the south, taking the drainage of both ranges, is somewhat wet and swampy, and is deeply covered with drift so that it has been but very little explored. The broad, high greenstone belt is a prominent feature in this region, rising, as it does, abruptly, to a considerable height, on the south side, above the valley of the Eagle and Montreal rivers. Through the eastern and central portions of the county it has a width of 500 or 600 feet, and is of a coarse-grained, compact texture, gradually squeezing out or changing in character, until reaching the south line of the county it has disappeared and does not again occur; its place is found to be occupied by amygdaloid.

The mines of Keweenaw Point, as do all the others in the mineral range, produce only native copper and do not, as elsewhere is the case, yield sulphurets or other ores of this metal. The copper obtained in the Michigan mines is exclusively native metal, unalloyed or otherwise chemically combined with any mineral. There is only a mechanical mixture of a limited quantity of silver, which is also native and pure.

Everywhere, in all the mines, in every class of deposits, whether fissure veins, amygdaloid beds, or conglomerate belts, at the surface and at all depths, the metalliferous product is the same—pure, native copper, and an occasional intermixture of equally pure silver.

So that the term copper ore, so frequently applied to the product of our mines by those not entirely familiar with this region, is in such connection a misnomer; no copper ores are mined in this State.

The metal is found deposited in the rock in all possible forms, from particles of microscopical fineness up to masses of hundreds of tons in weight. The rock containing the fine copper is manipulated in the stamp mill, the separation of the copper being effected by passing the crushed rock over a system of jigs, whereby the rock by its less specific gravity is floated off in the current of water, and the copper, being heavier, is allowed to settle and fall through the sieves. One set of jigs succeeds another, over which in succession the material, which has just dropped through the previous set of sieves, is made to pass, and the dirt, which is sustained in the water, is run off in the flow of the current, to waste. The number of jigs, the motion given to them, the strength of the current, etc., are so regulated as to secure the desired separation with the least possible loss of copper. An appliance more recently introduced, known as the Evans slime table, has proved to be an important adjunct in copper washing; its use is in saving the fine copper, that is the particles of copper, which are so fine and light that they readily float off in the water, and were not some extra method adopted to save them, would otherwise be lost.

The upper portion of the current of water, coming directly from the stamp heads in which floats this light copper and the fine dirt, is turned from the main launder by a partial cut-off into lateral ducts, which convey it to the large slime tables over whose conical-shaped, slow-moving surface it is made to pass. The stamp mills and copper-washing machinery used in the Lake Superior mines have reached a high state of perfection; large expenditure is incurred in their construction and every means is adopted to secure the best possible result. The advance which has been made in this region in this department of mining work, from the crude iron shod wooden stamps and hand buddles of an early day, to the stupendous structures with their intricate machinery, that now so successfully perform the work, is certainly wonderful. The simple mill, wherein could only be crushed and manipulated a few tons of rock and at a cost too great for a profit to accrue, has given place to those with a capacity of more than six hundred tons per day, wherein the manipulation is attended with but a tithe of the cost and difficulty which were inseparable with the earlier attempts. But the most extraordinary feature of this branch of our mining work is not in the large amount of rock which they are now enabled to work up—though that fact is also very remarkable—it is in the low cost with which all this manipulation is accomplished.

It could scarcely have been thought possible a few years ago, that this work should have been so perfected in this brief space of time, that thirty-eight cents per ton would cover the entire cost of treating a ton of rock in the stamp mill; but this result is achieved in one of the great mines on Portage lake.

Perfect and systematic as the mechanical manipulations in copper mining have, comparatively, become, a complete solution of the problem has scarcely yet been attained; there is still an element of final loss, invariably present in the result, that remains to be eliminated; though greatly reduced, a percentage of waste of fine copper is constantly represented in the tailings,—varying from one-fourth to perhaps one per cent—and this, in the aggregate, represents an important value.

The improvement of the stamp mill has revolutionized the copper mining business of the Lake, or probably it would be more accurate to say, that the stamp mill of to-day is the outgrowth of the necessities of the situation; it was the necessary instrument to the profitable working of the copper-bearing lodes of the country; the forms of copper known as barrel work and mass copper are of too infrequent occurrence to be longer the main dependence. No one now-a-days expects to open a mine for mass copper and barrel work alone; the rich stamp lode is rather sought for.

By barrel work is meant the small pieces of copper, with possibly a small amount of adhering rock, that are not too large to go into a barrel, down to a size of a pound or so in weight.

Mass copper represents pieces larger than those included under the head of barrel work. Such masses have been found of ponderous size—500 and 600 tons weight, pure native copper. In an early day when the existence of such masses was first made known, they were regarded as among the most extraordinary phenomena of this remarkable country, and became the chief object of search in the early mining explorations along the mineral range.

The fissure vein mines of Keweenaw Point, and all the mines in the Ontonagon district, with one exception, are generally known as mass mines, since the stamp rock which they have afforded has heretofore been of minor importance.

It is a sight worth more than the labor of the descent into a mine to see those rough horns of copper protruding from the vein, or to inspect one of those huge masses that the miners have, perchance, by the aid of innumerable blasts, succeeded in throwing down into the bottom of the level and upon which they are, perhaps, already engaged in cutting it up, or to witness their efforts to remove them to the shaft and elevate them to the surface. They are a pleasant thing tô see in a mine, when there are are enough of them, and no doubt more especially so to the interested stockholders.

Coming back to the Keweenaw peninsula, reference was made in the early part of this paper to the Southern or Bohemian range, as it is called. This range likewise extends through the entire length of the Point, and presents in places some very prominent topographical features. The hills in this range in the vicinity of Lac La Belle rise to an abrupt height of 864 feet above the surface of the lake; and further to the east, in Mt. Houghton, which rises to a height of 884 feet.

The direction of the Bohemian range is nearly parallel with the other; it forms the southern boundary of the valley of the Montreal and Eagle rivers, which course between the ranges, and finally break through to the west into the lake.

The fissure veins, which cross the formation of the Southern range in like manner as they do the Northern, do not contain copper in the native state, but combine with other minerals—copper pyrites—black oxide of manganese, holding a percentage of copper, etc.

In an early day much exploration was undertaken along this range, and numerous locations were made and some mining work was done in these veins of sulphuret; but in no instance was any marked success met with, and all of these early enterprises, undertaken in this range, have long since been abandoned, and for many years little or no exploration for mineral has been attempted; the range has been valued almost solely for its timber.

It remains to describe the mines of the Keweenaw district, and then in suc cession to sketch the other copper districts into which the mineral range is divided with a more detailed description of the leading mines which they each contain.

Commencing at the eastern extremity of Keweenaw Point we must journey west a distance of seventeen or eighteen miles, before reaching a mine that is now working, and yet this portion of the range was many years ago the scene of much activity, and embraces a great number of mining locations that were early made, and at which more or less work was done. But none of these mines on the east end of the Point were ever very productive, and all of them have long since been idle. The only one at which any work has been done for years is the Clark mine, the northwest quarter of section 9, town 58, range 28. Work begun here in a fissure vein in an early day and was prosecuted with some show of success. The working was north of the greenstone. The mine yielded 94 tons of copper in the aggregate. In 1881, a vein of black oxide of manganese on the estate of the Clark mine, near Copper Harbor, was opened, and 800 tons of this ore gotten out and shipped. The deposit is said to be limited, and no cheap method of separating the copper from the iron has been devised so as to render the working of it a matter of profit.

THE CONGLOMERATE MINE.

Of the mines on the eastern portion of the peninsula there are none worthy of present mention until we reach the Conglomerate mine.

The Conglomerate Mining Company has undertaken the largest mining enterprise ever attempted in the Keweenaw district, and naturally it attracts a good deal of attention and is the object of considerable public interest. The Conglomerate is the fourth organization that has been made to operate mines on the same location; commencing in an early day with the Northwest Company, which was succeeded by the Pennsylvania Mining Company, and this latter in turn by the Delaware, and in 1881 the Delaware relinquished to its present more brilliant successor. The earlier companies worked in fissure veins south of the greenstone, and all of them, after exhausting their capital stock, in addition to expending the funds which were derived from the sales of copper produced, were compelled to reörganize.

The Conglomerate company was formed to work the well-known belt of conglomerate which underlies the greenstone and which it was believed gave ample assurance of affording the metallic richness requisite to insure success. Certainly it would seem that only the fullest confidence in the metalliferous value of the lode would justify the extensive preparations which have been made, and are still in progress, and the enormous expenditure incurred. The shafts were begun in December, 1880, but were not pushed until 1881; in the short space of two years a large mine has been opened; it illustrates the rapidity with which openings are made. This great extent of opening is all in advance of the stoping, and is done simply with the view to be in readiness to meet the demands upon the mine for rock when the machinery shall be in readiness to crush it. The new mining plant will be of a magnitude commensurate with the extended underground work. In fact, everything done is upon a scale necessary for a first-class mine, in the sense that is now understood by that term in the copper country. It means the mining and treating in the stamp mill of 500 or 600 tons of rock per day, and this is what the management of the Conglomerate design to do. The mine has been so extensively opened with this end in view; the hoisting, compressor plant, etc., are of a power to meet the largest demands; and the stamp mill now building at Lac La Belle will have a capacity to treat 600 tons per day.

The mine is opened to the 6th level to a maximum depth of 1,130 feet, and the longest level is 2,000 in length; the drifts are unusually large, 9x12 feet, and the aggregate length of them is 6,000 feet. The shafts are also of ample size, being 10x14 feet, on a uniform inclination and in perfect line; their aggregate length is 1,280 feet.

They have derived material advantage in the work of opening the new mine. by having the old Northwest mine to work from. This latter is a fissure vein and crosses at nearly right angles to the formation and hence to the conglomerate belt which runs with the formation; the levels are driven from those in the Northwest; these latter are about 60 feet, vertically, apart, and this brings the levels in the new mine nearly 160 feet apart on the lay, which is at an angle of 22½ degrees with the horizon. There is a disadvantage arising from using the old mine, in the surface arrangements, which is chiefly in the fact that the rock-house is in a line with the old vein, at some distance to the south, and so a separate track must be run to each of the new shafts and finally come into one leading to the rock-house; these tracks are all laid on elevated trestle work, and the cars are run to and fro with a small locomotive engine. By a system of switches and side-tracks, the several shaft houses are reached. The arrangements are probably as complete as can be devised under the circumstances, but if the rock-house were in line with the shafts, as they are at most of the other great mines, it would be much more convenient. The rock-house is a good one, large and adequate, and as it has been built but a few years, it was not deemed advisable to discard it and build anew. The elevated track comes along the west side of the building near the top of it, and the cars discharge their contents into it by side dump. No work is doing in the old vein. The building for the new hoisting machinery will be located between No. 1 and No. 2 shafts, and the machinery which has been procured is deemed to be of sufficient power to operate the mine to a depth of 3,000 feet. The hoisting shafts will be No. 1, No. 2, and No. 3. The skip roads are very firm and true, so that the run of the skips up and down them may be safe and rapid. The new duplex compressor is a splendid machine, set in a stone fire-proof building and on a solid foundation; it has a capacity sufficient to operate 50 drills; they now operate from 12 to 20, No. 3 Rand.

A new stamp mill is building at Lac La Belle, which, when completed, will be one of the best appointed in the State. The building is already enclosed, and the machinery is putting into place. The situation of the mill is one of the best that could be desired; nature has done all that art could wish. It is placed on the level ground a few feet above the surface of the lake, and behind it, and on one side, rises the vertical wall of rock that attains to just the necessary height for the rock bins—the building being placed at a proper distance from the face of the bluff to have sufficient space for containing these shutes. The railroad track will run over these bins and the cars discharge the rock directly into them, whence it will run down under the stamp heads as required. The water contained in a small stream on top of the bluff will be conducted into the mill in a launder, but the additional water required will be derived from the lake. To obtain this a tunnel is being driven from the lake to the mill—160 feet in length—the bottom of the adit will be level, and a few feet below the surface of the water; at the inner end is a sump from which the water will be raised with the pump.

Two sets of Babcock & Wilcox boilers are in place, of capacity to furnish all the necessary steam, 640-horse power. The stamps are three in number, of the largest size Ball heads, 10-inch shaft, built at the Cuyahoga works, Ohio, of the same pattern as the one now in use in the Peninsula company's stamp mill. They are calculated to treat 200 tons each per day. The stamp mill building is capacious and substantial, the foundation being all upon the solid ledge, so that there can be no settling; it is all one inclosure, but somewhat in sections —that portion in which the stamps are placed being 25x75 feet, and the wash-house room beyond being 60x116 feet, with engine room, etc., projecting from the sides. Collum's jigs will be used and Evans's slime tables.

There is a small smelting furnace standing not far from the stamp mill, that was built by the old Lac La Belle or Mendota company, and it is thought possible that the Conglomerate company may use it. The railroad from the mine to the lake is seven miles in length, and makes a total ascent of 580 feet; it is now grading, and it is expected that it will be completed by September next, 1883. The line has been located by Mr. Chas. H. Palmer, Jr., a very accomplished engineer, and seems to have been excellently well chosen; all deep cuts are avoided—a necessary precaution against deep snows in winter—and the maximum grade is only three per cent, and that for no considerable distance; the maximum curve is 19 degrees, and that occurring on a low grade. The gauge is to be three feet; the distance to the mill is six and three-fourths miles, the additional one-fourth of a mile being required to get down to the lake, to the dock. The road will of course be built by the mining company for the sole use of the mine, but it is found that it may be necessary to organize under the general railroad laws of the State in order to secure the right of way. The line of the road is entirely within the Conglomerate company's lands, except for a short distance where it crosses a corner of property owned by the Resolute Mining Company, an organization that never did any work, but which owns some unoccupied lands in this vicinity, and which refuses to concede the privilege of allowing the railroad to cross any portion of it.

Lac La Belle is an inland lake, two and a half miles in length, east and west, and from one-half to a mile in width. It lies in townships 57 and 58, north, being across the town line, and in range 29; it is west from Bete Grise Bay in Lake Superior, about three-fourths of a mile, and is connected therewith by a natural channel one and a fourth miles long and by an artificial one which is cut directly east and west through the south half of section 34, town 58, range 29, and is three-fourths of a mile long.

This canal was completed in 1866 by the Mendota Mining Company, and cost $100,000; the channel was made of sufficient depth for vessels drawing eleven and one-fourth feet of water. The company received from the United States government, in aid of this work, a grant of 100,000 acres of land, and a further concession was made by the board of supervisors of the county, allowing the company to collect toll from vessels passing through the canal according to a schedule of rates fixed by the board. This canal was not very efficiently built; the piers were not extended far enough and were not substantial enough, and as no subsequent dredging was done, the canal has become partially filled with sand, so that for many years no vessels could pass through it. But in fact there never was any business at Lac La Belle to make it an inducement for vessels to enter it.

The Mendota company began work on a black oxide of manganese deposit, and built a small smelting furnace at the lake; they also laid out a village plat and built a number of houses on the north side of the lake; it was anticipated that the mining interests in the vicinity would prove prosperous, that the railroad to the Pennsylvania and other mines along the range would be built, and shipments for these mines would come to this harbor; but the whole enterprise was a failure; the mines about Lac La Belle proved worthless, as far as they were proved; the railroad was not built, the canal was allowed to choke up with sand, and the whole interests of the company here were abandoned. The lands of the company were sold for taxes, and there was no probability of the Mendota company resuming a foothold in the country. But that company still holds the charter to the canal, and now that the Conglomerate company are building the railroad, the stamp mill, etc., with the view to use the harbor, it becomes necessary that the canal shall be improved so that vessels can enter. To this end the Conglomerate company are negotiating for the transfer to themselves of the franchise of this canal company, which, if they secure, they will undertake the work of improvement.

The Conglomerate company hold the lands formerly owned by the Mendota company, and it is proposed to relinquish some of these as an offset for the transfer of the canal. By this improvement Lac La Belle would become a secure harbor; the water is said to be deep and everywhere free from shoals and rocks, and it would no doubt become of some importance to the general navigation of the lake, as a harbor of refuge in case of a storm or distress. Aside from its value in these respects Lac La Belle, as its name indicates, is in itself an object of intrinsic beauty; it possesses many advantages in this particular that few similar places can rival. The stamp mill, dock, etc., is upon the north side of the lake near the west end.

But to return to the mine, since it is upon this that is based all the expenditure and expectation of remuneration for the outlay. As previously stated, the mine is in the conglomerate belt that underlies the greenstone, and which at this point is very wide, 20 to 28 feet. It is a dry, coarse, moderately firm conglomerate, showing lateral and transverse slides; the copper, when it occurs, is found along the foot-wall to a width of ten or twelve feet. There is also copper in the rock next to the hanging, as is shown in several places where cross-cutting has been done to the hanging—but in these points the width of the copper is but a foot or two, and unless it shall show wider, generally, than this, it will hardly pay to mine for it. The mine is so extensively opened, with so small an amount of stoping having been done, that it is difficult to safely judge of its probable value; there is a great deal of barren ground, and there are also, to be sure, more limited stretches of lode, well charged with copper; but what proportion they bear to each other it is impossible to say; one might hazard an opinion but it might be a wrong one either way. One sees in going through the whole mine a great deal of copper, and the copper shoots seem to be persistent; some of the rock is very rich, some of it moderately so, but just what per centage it will average when six hundred tons per day are mined, I am not prepared to state. One great difficulty that must be met with in working this mine must arise from the extreme flatness of the lode, 22½ degrees; the rock will not roll down and will have to be handled over, shoveled down to the levels. Of course in so long a distance, 160 feet, this will be impossible, and "medium" levels will have to be opened, or lateral tracks run up either way diagonally along the foot-wall, crossing each other and extending from one level to the other.

The latter plan would be very feasible and the proper one to adopt were it not for the bars of barren ground that will have to be left, which will not pay to stope; these may render it impossible to extend tramways diagonally upward. To get the rock down from the upper breast stopes will be a serious matter in the economical working of the mine, and the additional work cannot add less than 25 cents per ton to the mining cost. The mine is dry and is very easily entered and ascended from.

So far, of course, the rock that has been worked up in the old stamp mill, has been taken mainly from the openings, and does not make a very good showing. During the past year there has been stamped 41,104 tons of rock, which represents 56 per cent of the amount actually broken. The yield of the mineral was 991,375 lbs., which smelted gave 671,681 lbs. of refined copper.

The stamp mill expense per ton of rock treated was	$1.06
Tons of rock treated in mine, per cord of wood used,	7.50
The total number of feet drifted was	3,029 3-10

Cost per foot for drifting, $10.52, which price included everything connected with the work, besides the profit on supplies furnished.

Average days' work, men and boys, per foot drifted,	4.29
Average supplies per foot charged up by company,	$5.31
Total number of feet of sinking done,	2,132 8-10
Average cost per foot,	$12.21
Average number of days' work per foot,	2.65
Average supplies per foot furnished by company,	$5.63
Total number of cubic fathoms of stoping done,	2,563.54
Average cost per cubic fathom,	$9.23
Average number days' work per cubic fathom stoped,	1.81
Average supplies per fathom stoped, furnished,	$5.09
Total amount of cross-cutting done, feet	321
Average cost per foot for cross-cutting,	$12.53
Average days' work per foot for cross-cutting,	3.12
Average supplies per foot for cross-cutting,	$4.58

The cross-cutting was from foot to hanging wall.

Total amount of stoping in cross-cuts, fathoms	136.75
Average cost per cubic fathom cross-cutting stope,	$11.40
Average days' work per cubic fathom cross-cutting stope,	2.28
Average supplies per cubic fathom cross-cutting stope,	$5.87
Total amount of cubic fathoms in cutting flats,	105.66
Average cost of cubic fathoms in cutting flats,	$12.12
Average days' work per cubic fathom cutting flats,	2.52
Average supplies per cubic fathom cutting flats,	$4.70

Which includes timbering.

Average wages paid for drifting—power drill work, per day,	$2.12
Average wages paid for sinking—power drill work, per day,	2.30
Average wages paid for stoping—power drill work, per day,	2.02
Average wages paid for cross-cutting—power drill work, per day,	2.42
Average wages paid for cross-cutting stope—drill work, per day,	2.21
Average wages paid for cross-cutting plats—drill work, per day,	2.93
Average wages paid for cross-cutting three shafts—drill work, per day,	2.93
Average wages paid for all contract miners, per day,	2.18
Average wages paid for all company account miners, per day,	1.73
Average wages paid for all underground laborers other than miners,	1.44

Average number of men employed, 350.

The number of men employed during the coming summer will be increased to 500, including the railroad laborers.

The yield of mineral in the rock treated, was 1.22%.

The number of tons broken in the mine was 85,000. Nunber of tons rock hoisted was 75,000. The cost per ton of rock broken in the mine was $2.52. This was distributed over a great extent of sinking and drifting.

It is found that the loss of copper in the tailings is 69-100 of one per cent. Fifteen dollars per share, on 50,000 shares, has been called and expended, and a further call recently made of $3 per share, making the total assessments so far $18 per share—$900,000.

There are about 200 good houses on the location; 18 new ones have been built the past year; they are all on stone foundations, and are frame buildings, painted, etc. Everything at this mine is done in a substantial workmanlike manner.

The stamp mill will be completed in about July next, and the railroad in about September.

The capital stock is $2,500,000, divided into 100,000 shares, 50,000 of which are fully paid up.

The officers are H. C. Davis, President; Chas. M. Foulke, Treasurer; Geo. H. Lewars, Secretary. Business office, 205 Walnut Place, Philadelphia, Pa. Mine office, Delaware, Mich.

A. P. THOMAS, *Agent.*
JAMES HOATSON, *Mining Capt.*

The product of the Northwest, Pennsylvania, Delaware, and Conglomerate companies, is as follows:

Years.	Tons.	Lbs.
Previous to 1855	555	......
1855	99	80
1856	1	1,348
1857	29	543
1858	83	100
1859	74	144
1860	121	97
1861	54	1,920
1864	111	660
1865	241	861
1866	64	90
1867	163	660
1872	81	1,161
1873	170	743
1874	40	1,271
1875	12	1,260
1876	88	1,701
1877	16	1,417
1878	140	345
1879	70	12
1880	116	1,814
1881	193	91
1882	335	1,681
Total product	2,865	1,518

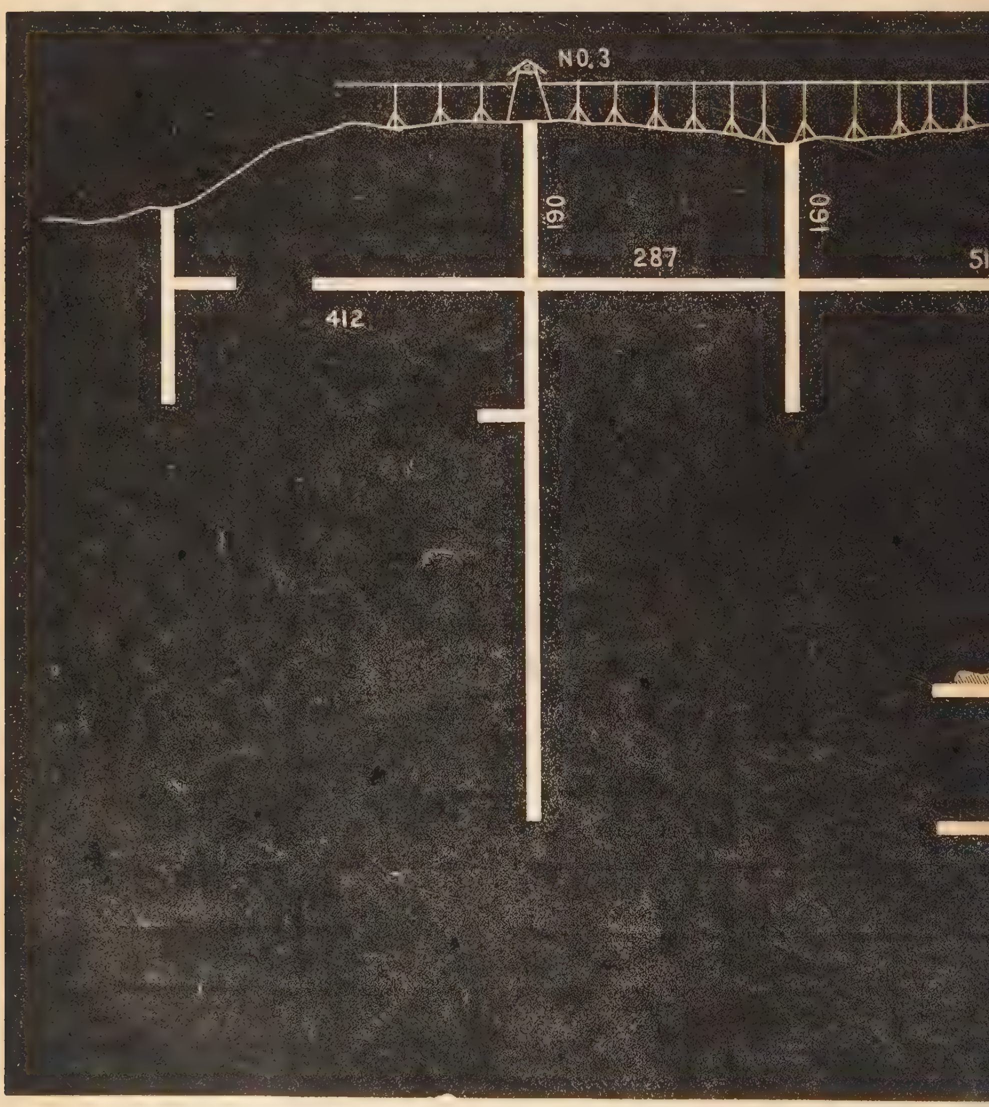
The location is section 15, town 58, range 30, and work was first begun here in 1847.

BRITISH AMERICAN MINING COMPANY.

This location is the north ½ of section 11, and the south ½ of section 2, town 58, range 30, situated north of the greenstone. A little work was done here, commencing about in 1854, on a vein that bears north, 25° west, and which has a considerable width—2 to 3 feet. It is made up of bits of rock cemented

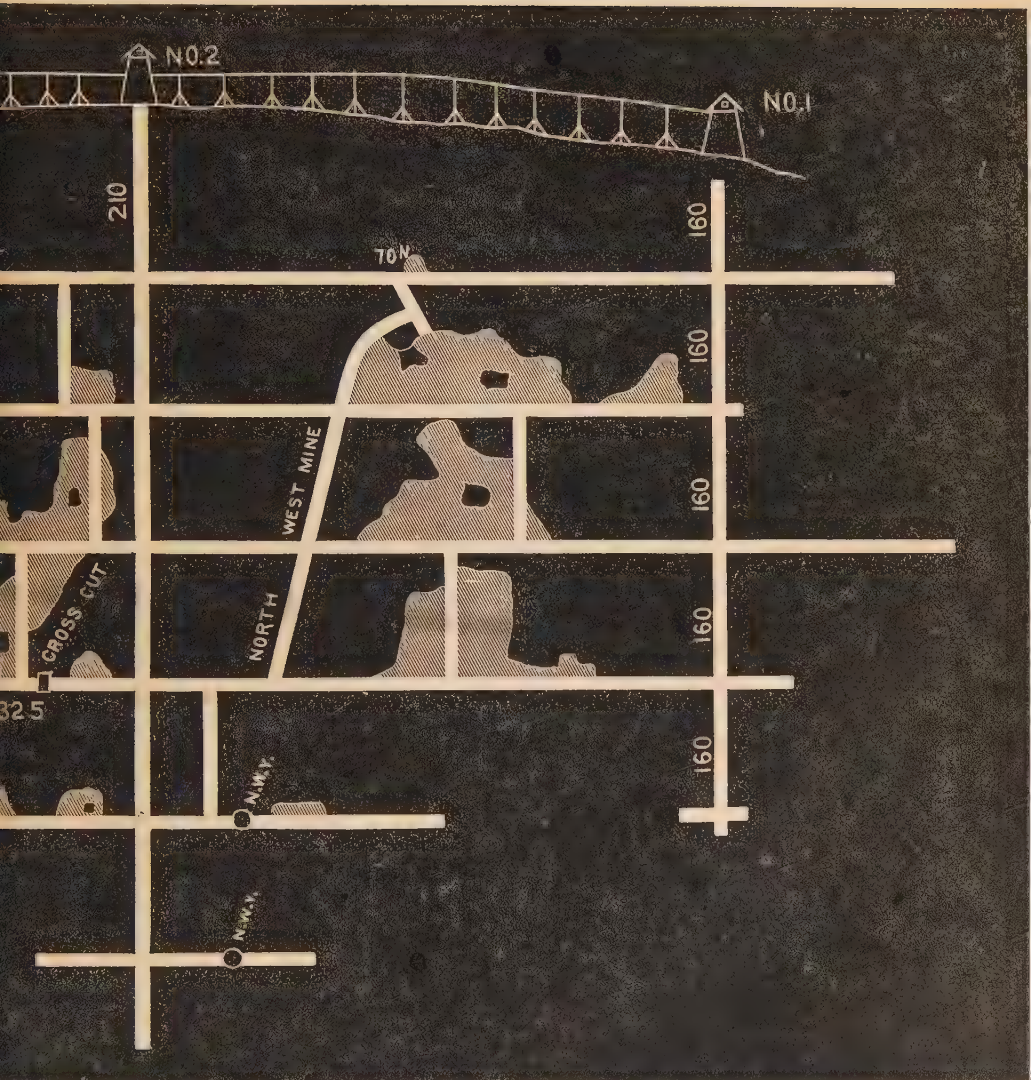
CONGLOMERA

Scale,



INE, JAN., 1883.

one inch.



together with vein matter and sprigs of copper and has been traced for upwards of half a mile in length. There are several veins on the property, but most of the work that has ever been done in them was by the "ancient miners."

During the summer of 1881, Captain J. H. Carisgabiss, with five or six men, commenced working on a fissure in the ash bed, on this property, and they are still prosecuting their undertaking with, it is claimed, some prospect of success. The location is about a mile west from the Delaware.

MADISON MINING COMPANY.

It will be remembered, as fully described in previous reports, that under the new organization made in September, 1879, this company resumed work in the year following, on a small scale in the last vein at the north end of the mine, in the fourth level—350 feet below the surface.

There are two veins, or perhaps splits of the same vein, that have been worked, which are tending together, and it is estimated that they will join at a depth of about 100 feet more. It has always been assumed that when this line of juncture is attained, and the vein thus becomes united and settled, it will be found to be productive of copper in a large degree. This opinion is based upon the general mining experience of the country, regarding the increased productiveness of the ground along the line of the juncture of two veins.

The work recently undertaken at the Madison was with the intention to open the ground in the east vein, down to the line of its intersection with the west one. This work, begun in 1880, has been moderately prosecuted under the direction of Capt. Joe. Snell, until in May, 1882, when the funds becoming exhausted, and a plan for selling the property having been adopted, the work at the mine was discontinued; the pumps, however, were kept going until December; the object of preserving the mine free of water, being to afford the parties who were negotiating the purchase, a full opportunity to examine it. Work was first begun here in 1853, on the two veins above mentioned. They are about 200 feet apart on the surface, and as before said, underlay towards each other. They are similar in character, being largely impregnated with chlorite, containing also quartz, prehnite, etc. Neither has proved, thus far, sufficiently productive in copper for profitable working. None of the copper bearing belts south of the greenstone have been worked. Capt. Snell says, however, that the conglomerate belt immediately underlying it is in the lowest points in the mine where it has been proved, seven or eight feet wide and, apparently, contains a fair amount of copper.

The estate comprises 2,000 acres in one body, lying south of the greenstone, and stretching upwards of two miles north and south across the whole of sections 19 and 30 and S. ½ of the S. W. ¼ of section 18, in township No. 58 N., range 30 west; the mine is in the west half of section 19. The length of the property south of the summit of the range is sufficient to insure the fact that it must be crossed by all the known copper belts of the country, Calumet & Hecla, Osceola, Kearsarge, etc. None of them have been discovered or sought for on the property, but unquestionably it contains them, and they will be found when proper exploration is undertaken for that purpose, but whether they will be found to contain copper in paying quantity there is no means of conjecturing.

The land south from the mine is generally level and deeply covered with alluvial deposit, so that any successful exploration must be somewhat difficult and expensive; but there is no reason why it may not be a valuable property; the chances are certainly in its favor.

Mr. E. P. Kibbie of Hancock has the agency and full power to dispose of the property, and has entered into negotiations for that purpose with English parties. These gentlemen have had the property examined and a favorable report was made, and the terms have been agreed upon. A final inspection by gentlemen from England will be made in May, when it is expected the transfer will be made.

The capital stock is $1,000,000, divided into 40,000 shares. The officers are Chas. Le Sier, President, Detroit; John W. Betcher, Secretary and Treasurer, Boston; Joseph Snell, Agent, Hancock, Mich.

PRODUCT OF THE MADISON IN PAST YEARS.

Years.	Tons.	Lbs.
1856	2	------
1857	8	------
1865	7	881
1866	17	------
1878	----	1,676
1881	----	1,534
1882	----	------
Total product	36	91

CENTRAL MINING COMPANY.

For many years the Central has been the only dividend-paying mine in Keweenaw county. It has been a successful mine from the start, and there has been no period in its history that it has failed to pay its way. The location of the mine is the E. ½ of section 23, town 58, range 30, south of the greenstone. The fissure vein in which the mine is opened was discovered in 1854, and in one year the mine had produced 67 1-5 tons of refined copper, which sold for the sum of $36,962.36, being $7,251.07 in excess of all expenditure and liability which had been incurred.

The company made its first dividend in 1862, and during the 20 years that have since elapsed there has been no failure to annually repeat it. The total calls that have been made on the stockholders amount to only the sum of $100,000—$5 per share, and this was to aid in equipping the mine on the start; since it fairly began work it has paid its own way and returned each year a dividend to its stockholders. The Central has, in many respects, a remarkable record; it has proved to be productive to a greater depth than any other mass mine that has been worked on the Lake; it has been uniformly productive; that is, while the product in some years has exceeded or fallen below that of the preceding year, it has always been large enough for a profit, and the indications have always been sufficiently favorable to leave little cause for uneasiness.

The affairs of the company have, apparently, been very economically managed. It has borne the reputation of being a conservative company, and everything has been done with the view to necessity and with economy.

The opinion has prevailed, based on the history of the Cliff, Minesota, and National, etc., that mass veins in the Lake Superior copper region will not continue productive to an indefinite depth, and this theory, whether true or erroneous, as an ultimate fact, has been settled in the affirmative, so far as is now known of the mines just mentioned, and is also borne out by the present condition of the Central. For nearly two years past the Central has yielded very little mass copper; it continued as usual, productive, until in 1881, when it failed to reveal its customary treasure, and all subsequent efforts to discover sufficient mineral to restore the productiveness of the mine have proved comparatively unavailing.

The falling off of the product will be seen from the following:

In 1880 the yield was 1,013 tons, 78 pounds of refined copper.
1881 " " " 709 " 765 " " " "
1882 " " " 676 " 1597 " " " "

Nearly two-thirds of the product for the past year was stamp work, derived largely from the south conglomerate—the Calumet and Hecla conglomerate, as it is supposed to be. This belt has been worked the past year from the 20th level, north of No. 4 shaft, down to below the 22nd level. An inclined shaft has been made in it, and will be continued down in this belt. The conglomerate has a width of three to four feet, and is productive for a distance of about thirty feet each way from the vein, when it no longer pays to work; the workable portion of the lode carries a high percentage of copper, and thus becomes a valuable auxiliary under any circumstances, and just now, when the other productive portions of the mine have so nearly failed, this conglomerate, limited as it is, is the all important requisite.

Besides the work in this conglomerate, No. 2 shaft has been sunk one lift, to the 23d level (230 fathom level), and a small extent of drifting done each way from it at the bottom. The six lower levels, from the 17th down to the 22nd, have been extended to the south, each one from 50 to 200 feet; a small amount of stoping has also been done south of No. 2, between the 16th and 17th levels, 17th and 18th, 18th and 19th, 20th and 21st, all in the vicinity of this No. 2 shaft. It will be seen by inspection of the map, that from the 17th level down but little stoping has been done; the ground has proved too poor to pay, the vein has been narrow and opened into few pockets of copper; and there are no indications of any improvement. Certainly the bottom of the mine is anything but promising. Still it is probable that the product the ensuing year will equal that of the last, and then something better may develop. From the results of the year's business the company paid a dividend of three dollars per share—$60,000, a falling off from the dividend of preceding years, but still a good profit.

It will be seen that there is a good deal of ground that has not been proved; below the 10th level the stoping is all, or nearly all between the shafts; it was rich copper ground, but has suddenly ended; above the 10th a large amount of ground was stoped, to the north of No. 4 shaft, nearly to the greenstone; but below the 10th little has been done in this direction. The 12th, the 14th, the 16th levels were extended to the north, but the vein was poor, no copper, so that beyond this limited exploration all this ground has not been proved.

The statistics of the mining work for the year are as follows:

No. of feet of shafts sunk was	278 9-12
No. of feet of drifting done in the vein was	1288 4-12
No. of feet drifting done in the conglomerate was	149 3-12
No. of fathoms stoped in the vein was—superficial	1696
No. of fathoms stoped in the conglomerate was—superficial	283 17-86
No. of feet of sinking in the conglomerate	192 9-12

Total amount of ground broken in openings and in stopes 4097 superficial fathoms.

	Pounds.
Total production of barrels of stamp mineral 871, weight	1,165 945
Total production hogsheads kiln mineral 128, weight	399 885
Total production masses mineral 98, weight	237 990
Total amount of mineral produced	1,803 800

Or 901 tons, 1,800 pounds, which smelted gave 676 tons, 1,597 pounds of refined copper.

The average yield of mineral per fathom of ground broken in the mine was 440 1-3 pounds.

No. of tons of rock stamped was	18,639
The yield of mineral per ton of rock stamped was	3 19-100 per cent.
Total stamp mill expense for manipulating a ton of rock was	88 43-100 cents.
Running time of 24 heads stamps	142 2-3 days.
Tons of rock treated per 24 hours running time per head	5 4-10.
Tons of rock treated to cord of wood used	10 26-100.
Cost per ton of sorting, breaking rock, and tramming to mill	11 61-100 cents.
Average number of miners employed was	125.
Average wages paid for contract miners per month	$48 56
Twenty-six days reckoned to the month.	
Average monthly wages paid surface men was	42 70
Average number of surface men employed 42.	
Average number of stamp mill men employed 14.	
Average monthly wages paid stamp mill employés	41 51
Average cost per foot for sinking shaft	28 09
Average cost per foot for drifting on vein	10 50
Average cost per foot for drifting on conglomerate	12 11
Average cost per superficial fathom for stoping on vein	15 26
Average cost per cubic fathom for stoping on vein	22 98
Average cost per superficial fathom for stoping on conglomerate	23 62
Average cost per foot of sinking on conglomerate	16 29
Average cost per square foot of surface cut for cutting up masses of copper	12 79

The above includes both power drill and hand drill work, the greater portion of the work, however, being done with air drills.

The prices given are what the men received and does not include the profit made by the company on the supplies furnished.

The company uses wood for fuel, exclusively, and it costs $2.75 per cord, which includes 15 cents per cord paid for stumpage.

Very little has been paid on construction account the past year. Six additional washers have been put into the stamp mill.

The Central mine has produced each year as follows:

Years.	Tons.	Lbs.	Years.	Tons.	Lbs.
1856	32	403	1870	663	1,156
1858	71	1,011	1871	716	662
1859	84	312	1872	623	56
1860	125	1,370	1873	751	1,117
1861	70	139	1874	870	900
1862	133	1,972	1875	733	952
1863	278	1,548	1876	1,080	1,400
1864	381	1,855	1877	997	1,640
1865	346	1,200	1878	945	1,013
1866	574	1,842	1879	899	1,495
1867	687	745	1880	1,013	78
1868	1,353	1,827	1881	709	465
1869	903	1,801	1882	676	1,595
Total				15,896	1,576

The officers are Geo. A. Hoyt, president; John Stanton, secretary and treasurer, office 76 Wall street, New York; James Dunstan, agent; Samuel Bennett, mining captain; J. F. Robert, clerk, Central Mine, Mich.

CENTRAL MINE.

ANNUAL REPORT.

The directors present the following statement of the operations during the year 1882:

The production of mineral was 901 1800-2000 tons, and the quantity smelted was 960 1475-2000 tons, which yielded 70 44-100 per cent, or 1,353,597 pounds of refined copper.

The following is a summary of the year's business:

PRODUCTION.

Copper sold	775,054 lbs. at 17 80-100c	$138,014 66
Copper on hand	578,543 " valued at 17c	98,352 31
	1,353,597 " av'ge 17 46 100c	
Silver		1,126 02
		$237,492 99
Mineral at mine, Dec. 31, 1881, as per last report, valued at	$24,602 00	
Mineral at mine Dec. 31, 1882, 64 345-2000 tons, valued at	12,834 50	
Decrease in value of mineral at mine		11,767 50
Net value of product of 1882		$225,725 49
Add interest received		5,050 61
		$230,776 10

COSTS.

Working expenses at mine	$157,908 37	
Smelting, freight, and all other expenses	33,850 15	
Net operating expenses		191,758 52
Showing a profit of		$39,017 58
There has also been received on account of sale of timber		40,000 00
Making an increase of available assets of		79,017 58
The surplus from 1881, after payment of dividend, Feb. 4, 1882, was		198,236 77
Making the net surplus Dec. 31, 1882		$277,254 35

As shown in detail in the annexed statement of assets and liabilities, and from which a dividend of $3 per share ($60,000) was paid February 1, 1883.

The production during the year shows a further decline, being about 50 tons less than that of the previous year, notwithstanding that a larger amount of ground was broken. The vein has continued to be of small size, and although fairly productive in stamp stuff and small pieces of copper, has been almost destitute of the large masses hitherto so characteristic of it. The mine openings have been vigorously prosecuted in the expectation of developing more productive ground, which is looked for with confidence if the vein should increase in width.

The directors have concluded a sale of the pine timber on the lands owned by the company on Tobacco river, for the sum of $100,000, payable in installments extending over three years. These lands have cost the company about $10,000, and as the location of them is at too great a distance from the mine for the timber to be available for the mine use, the sale is believed to be a judicious one. The cost of all the lands owned by the company (exclusive of the mine location), stood on the books at $20,988 25-100, and the receipt of $40,000, on account of the above sale, has enabled the directors to write off this item, and increase the yearly dividend.

For more detailed information we refer to the agent's report, and the financial statements herewith submitted.

GEO. A. HOYT,
JOHN J. CRANE,
ROBERT PORTERFIELD,
WM. C. STURGES,
A. J. HATCH,
JORDON L. MOTT,
Directors.

New York, March 28, 1883.

ASSETS AND LIABILITIES, CENTRAL MINING COMPANY, EXCLUSIVE OF REAL ESTATE AND MINE PLANT.

Assets.

Cash		$20,273 63
Loans		68,000 00
Silver on hand		1,126 02
Copper on hand, 578,543 lbs. valued at 17 cents		98,352 31
		$193,751 96
At mine,		
64 345-2000 tons mineral, at $200	$12,834 50	
Cash	3,789 89	
Merchandise in store	37,767 54	
Supplies	59,903 44	
		114,295 37
		$308,047 33

Liabilities.

Agent's drafts	$4,103 41	
Indebtedness at mine	19,306 23	
Accounts payable	7,383 34	
		30,792 98
		$277,254 35

Less dividend, February 1, 1883, of $60,000.

BALANCE SHEET, CENTRAL MINING COMPANY, DECEMBER 31, 1882.

General expenditure to December 31, 1881,		$5,395,936 17

Expenditure in 1882.

Central mine	$164,826 62	
Freight	8,720 04	
Smelting	17,250 59	
Insurance	918 20	
Brokerage	1,179 22	
Expenses	5,782 10	
		198,676 77
Dock and warehouse		9,112 07
Dividends		1,610,000 00
Cash		26,273 63
Loans on call		68,000 00
Copper on hand		98,352 31
Silver on hand		1,126 02
		$7,407,476 97
Capital advanced by stockholders		$100,000 00

REAL ESTATE.

Sale of timber	$40,000 00	
Less cost of real estate	20,988 25	
		19,011 75

SALES OF COPPER.

Sales previous to 1882	$7,038,538 28	
Sales in 1882	236,366 97	
Silver in 1882	1,126 02	
		7,276,031 21
Interest received in 1882		5,050 61
Accounts payable		7,383 34
		$7,407,476 97

AGENT'S REPORT.

Central Mine, Keweenaw County, Mich.,
January 1, 1883.

John Stanton, Esq., Secretary and Treasurer, New York:

Dear Sir,—The following report is respectfully submitted for your consideration, and shows in detail the various expenditures at the mine, for the year 1882:

GROUND BROKEN.

Sinking in shafts and winzes, 278 9 12 feet, average cost	$28 09
Drifting on the vein, 1,288 4-12 feet, average cost	10 50
Drifting on the Conglomerate, 149 3-12 feet, average	12 11
Stoping on the vein, 1,659 18-36 sup. fathoms, cost	15 26
Stoping on the vein, 37 89-216 cubic fathoms, cost	22 98
Stoping on the Conglomerate, 283 17-36 sup. fathoms, cost	23 62
Sinking on the Conglomerate, 192 8-12 feet, cost	16 29

The total amount of ground broken in openings and stopes is 4,097 fathoms.

PRODUCTION.

871 bbls. stamp copper, weighing	1,165,945 lbs.
128 hhds. kiln " "	399,885 "
98 masses " "	237,970 "
Total	1,803,800 lbs.

Average yield of mineral per fathom of ground broken	440 lbs.
Average yield of ingot per fathom of ground	310 "

STAMP MILL.

The expenses at the mill were as follows:

Labor	$,6774 59
1,913 cords wood consumed	6,217 25
Lights, oils, shovels, etc	411 26
Repairs, materials, fixtures, etc	2,653 44
Lumber, freight, and teaming	425 94
	$16,482 48
Tons of rock stamped	18,639
Yield of rock in mineral	3 12-100 per cent
Yield of rock in ingot	3 20-100 " "
Cost of stamping and washing per ton	88 43-100 cents
Running time of 24 heads	142⅔ days
Rock stamped per head, 24 hours running time	5 4-10 tons
Rock stamped and washed per cord of wood consumed	9 74-100 "
Cost per ton of breaking and selecting rock and tramming to mill	11 69-100 cents

During the past summer, we placed a new foundation under the engine at the stamp mill, the condition of the old foundation being such as to make this absolutely necessary. Six new copper washing machines have been added, and other essential improvements made. The mill throughout is in much better shape for economical work and the saving of copper, than at any time heretofore.

SINKING.

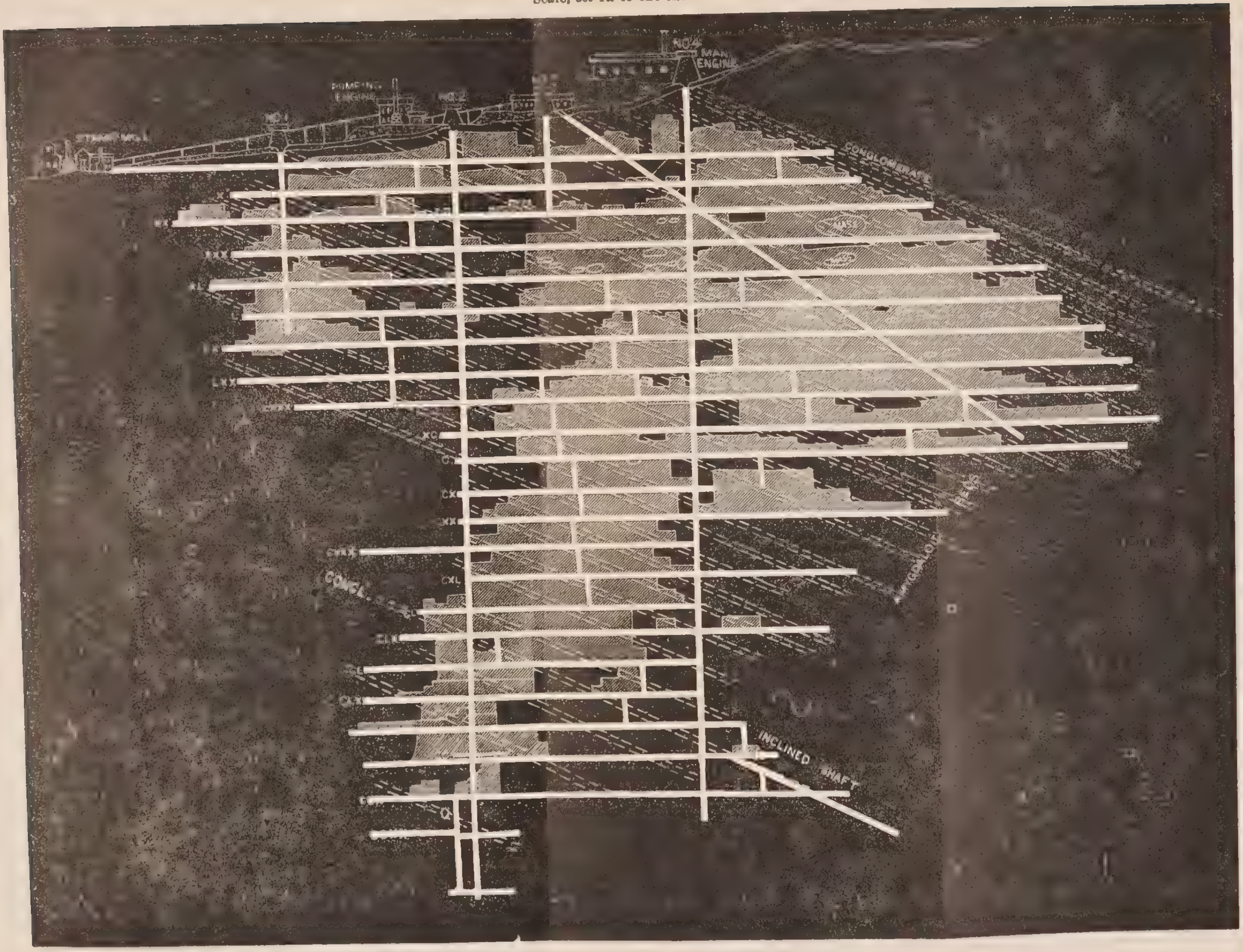
No. 2 shaft has been sunk from the 22d to the 23d level. The skip road and pump in this shaft have been continued the same distance. These levels have been connected by a winze opposite the above shaft. This winze has been sunk on the east side of the vein. At the 23d level the vein was uncovered, and it is two feet in thickness, and shows good stamp rock, and barrel copper. The inclined winze on the south belt of conglomerate has been extended 137 feet during the past year. At one place in the conglomerate for a distance of 30 feet on the incline, it was barren of copper, but below this point it has developed into its usual richness, and is three feet thick on an average.

DRIFTING.

The 23d level has been driven north of winze 79 3-12 feet; we have passed through the belt of amygdaloid, from which we obtained some copper in the level above. This belt yields some good copper rock, but the vein is contracted. We have also extended this level south of the winze 61 9-12 feet. The first 25 feet discovered a two-foot vein well charged with stamp and barrel copper. Beyond this point the vein has been poor. A cross-cut has been made from No. 2 shaft at the 23d level to the winze, a distance of 161½ feet. The 22d level has been driven north of No. 2 shaft 123 feet, and south of same 267 0-12 feet. In the south drift the vein for 150 feet has been quite good, carrying stamp and barrel work, with a few small masses. Beyond this the vein has been narrower, but still yielding good stamp rock, and during the past few days the vein has widened to four feet, and is very much improved in richness. The 21st level has been carried north through poor ground to connect with No. 4 shaft, and it has been extended south 178 4-12 feet. It has opened up some good stoping ground. The vein has been very variable, from four feet only to a few inches in thickness. The 21st level has been driven north of No. 4 shaft 144 2-12 feet, to intersect the belt of conglomerate. The vein has been small and poor the entire distance. The 20th level has been driven south of No. 2 shaft

VERTICAL SECTION OF THE CENTRAL MINE, JAN., 1883.

Scale, 360 ft. to one inch.



130 6-12 feet through poor ground. The 19th level has been extended south of No. 2 shaft 35 feet, to reach a belt of amygdaloid which carried copper in the level below. This belt has yielded good stamp rock while near the vein.

STOPING.

We have as yet done very little stoping in the back of the 23d level, but I expect this back will yield some heavy copper as we work up. In bottom of the level above we have a very good show of mass copper for about 60 feet in length, which seems to be the top of a good run of copper ground. We have considerable ground yet remaining in backs of the 21st and 22d levels, which will produce a large amount of stamp and barrel copper, but there are no heavy masses in sight. The greater portion of last year's mass copper came from these stopes. We have done considerable stoping on the different belts of amygdaloid, which has given us quite a large amount of low grade stamp rock near the vein, but they all become poor a little distance from it. The south conglomerate has been uniformly rich near the vein throughout the year, and has been a very great help in keeping the stamp mill supplied with rock.

MACHINERY, ETC.

The compressor and its accessories are operating very satisfactorily. They contribute materially to the reduction of our expenses, and enable us to drive, sink, and stope much more rapidly than was before possible. We now sink 100 feet lifts, and with underground engines worked by compressed air, raise the rock from the bottom of the shaft to the first level above, which was impracticable, or at least very expensive, with windlass and hand labor. The machinery on the company's property is in good condition.

Respectfully,
JAMES DUNSTAN, *Agent.*

THE COPPER FALLS MINING COMPANY.

It is pleasant to note the improvement in the Copper Falls mine since I went through it two years ago. The mine is much more extensively opened now than it was then, and is showing much more favorably for a yield of copper. In the west end of the mine, from the 6th level down to the 11th, the mine may be said to be looking extremely well. It is well opened for stoping, and the stopes show, for the ash bed, rich in copper. The Copper Falls mine is north of the greenstone, on the northern slope of the range, directly north of the Central Mine. The longitudinal section herewith shown is the old Owl Creek vein mine, opened in a fissure that crosses the formation. The main workings are in the ash bed, east and west from this vein, and the product is all brought out into the main adit, the 90-fathom level, which leads out to the north, to the stamp mill. The extreme distance that the opening extends to the west from the adit is 900 feet, and to the east the extreme point to which the opening has been extended is 1,000 feet. The ash bed dips to the north at an angle of 27° or 28°, and for a considerable distance on the east side of the vein is beaten out upward to near the surface. Its average width is seven feet. As now worked, it is really a mine, opened by a long horizontal shaft, through which everything passes into and out of the mine, with openings in the vein extending vertically upward to the surface, that secure ventilation.

Entering the mine through the long adit, which is laid with light T rail, over which run the cars drawn by mules, there is nothing of importance to observe until we reach a point 400 feet north of Spencer shaft, where they are following a branch vein, east of the adit; it runs up through a broad belt of feldspar, and seems thus far to afford considerable copper, along the foot. It was started a year ago, but in the hanging, and as it proved poor was abandoned. The work now in progress began recently, and they have taken out enough barrel work to pay all cost, and have also about fifteen tons of stamp rock, that will go 1% ingot.

They have just now, not far from the same point, a fine show of coppers for a small one. It is forty feet below the 90—(9th level), and was the same place where a similar find was made last winter. The former pocket was worked out, but on drifting about ten feet west they have come into some rich ground, where they have already gotten out about 2 tons of small masses, and there is now a mass protruding from the vein, that reveals more than a ton of copper to sight, and the mass is still solid, and is probably much larger. There are at this point several branches of vein which, apparently, unite at greater depth, as they tend toward each other. If such is the case, and these branches combine into a single vein, it is very probable that it will be found to contain copper, possibly in large quantity. All the work in the ash bed now doing, is west of the main adit, 90 level; and all the product in the west end mine is brought to the cars in this level, from the levels above it and below it. Loaded cars from below and from above are raised or lowered on a gravity incline that has been made at a point 160 feet west from the Spencer shaft; it runs up to the 7th level, 350 feet above the 9th, and down to the 11th. The up and down tracks, from the 9th level, are not in the same line, the one extending below being ten feet to the west of the other. They are operated with drums and break and air engine; the down car aids to the extent of its weight to draw up the ascending one, the engine doing the rest. Going to the west on the 9th level the opening reaches 900 feet; it is 850 feet to the breast, and the drift has been extended 50 feet further. It is the intention to put in an incline here, running up to the medium level, 100 feet above the 9th. The west 200 feet of the ground opened on this level is good and reaches all the way up to the medium level, that is to the level that comes midway between the 9th and the 8th.

The 8th level is 220 feet above the 9th on the lay of the bed, and it is 500 feet from the main vein to the breast in this level. All the way up to the 7th it is good ground, showing copper in some places unusually rich. In the 6th level they tram the dirt to a shute that runs down 65 feet. A car under the lower end receives the rock, and thence it is trammed to the incline, and run down to the 9th level. This shute, by being raised as much as possible at the upper end, and correspondingly lowered at the other, is given an inclination of 32 degrees, so that the dirt readily drops down it.

The stoping and drifting are carried along together, and the work paid for by the fathom.

The tramming is done by the month, that is the work is now let to eight men, who take all the rock to the main adit; they keep the mill supplied, and they receive each, per month, $44. Three cars are loading at the same time, two men to one of the cars, and to each of the others three men; they change about from week to week, so that each party shall have its share of the short and the long trams. One car is working in each level. These men take the rock to the main adit—about a hundred and fifty tons per day. The longest tram is 850 feet, in the 9th level west, but this long tram will be done away with by running the main track to the west along this level. They are now cutting the walls and straightening the track with the view of making ready for the mule tram. A dislocation of 50 feet occurs in the formation, 500 feet west from the Owl Creek vein, at what is called No. 2 vein, and in reaching the bed to the west of the fault, the track curves pretty sharply to the south, and this portion is being straightened for the main track. The ash bed is worked below the adit level 200 feet. The gravity incline is between the adit and No. 2 vein. The cars run onto a turn-table. The 10th level has just been extended west of No. 2 vein, and is looking very well for copper. The 11th is merely sunk to and not much drifting has been done. The medium level above the 9th is 200 feet west of No. 2 vein with the breast stope, and the 8th level is 100 feet west of this vein; the 7th level is yet 25 feet east of the vein, and the 6th level has reached the same point, 25 feet from No. 2 vein.

The breast stopes are reckoned 35 feet high, and the full width of the vein; the remainder of the back is taken in one or two back stopes leaving only the pillars. Taking the dirt down to the levels, to the trammers, is a serious matter; it all has to be shoveled; the rock is so soft and friable that it packs and will not slide or roll down on the flat foot wall. At this time twelve men are employed in this work of handling the dirt, getting it from the stopes to the trammers. It must be taken away about as fast as it is broken, owing to the narrowness of the bed. If it were steep enough for the rock to roll down, out of the way, the expense of these twelve men would be saved to the company.

No work is doing east of the adit in the ash bed, though the workings in this direction have nearly reached the Dibble vein, which latter was opened by a short adit many years ago, and some mass copper taken out. The ash bed at the limit of the east workings is poor, but it might be well to push on through the poor ground to the vein. The experience of the ash-bed working in this mine has been that it does not remain barren for any great distance; the poor ground is usually succeeded by that which is reasonably good. In the 9th level, to the east, the work has reached a distance of 650 feet from the adit. Near the vein many years ago a large body of the roof fell in, killing some men. This fatal accident seems to have been due to insufficient support. The formation was of course cut by the vein, so that the roof was held only on the sides, and unfortunately too great distance was allowed between the pillars. Above the 6th level, on the east side, the back has all been beaten away for a distance of 1,000 feet from the vein. Below the 9th, in the east side, only one block of ground has been taken—300 feet from the adit.

The west end of the mine is well opened and the stopes judiciously arranged, so that a far larger amount of rock could be mined than is now taken out. There are two stamp heads in the mill. I can see no reason why both might not be run and kept supplied with rock. There is enough productive ground in sight to afford a daily product of 300 tons of rock with no more difficulty than they now mine 150 tons; an increase of force will be necessary.

The 6th, 7th, 8th, 9th, and 10th levels all show good stopes; rich enough, one would estimate from the appearance, to yield a greater percentage of copper than it actually does give. The drawbacks to the ash bed are its low percentage of copper, its narrowness, and its low angle of inclination with the horizon. In some other particulars it has advantages; it is soft and easily mined. At the Copper Falls the mine is drained by the adit, so that the expense of pumping is nearly dispensed with, and the use of costly hoisting machinery is obviated by having the cheaper mule team to haul out the loaded cars instead of hoisting them up a long shaft.

The eight men who have the contract for the underground traming deliver the loaded cars at the depot, which is at the Spencer shaft in the main adit; thence they are taken on company account to the stamp mill, being drawn out to the mouth of the adit with mules, one mule drawing five cars.

They work five or six drills—one of which is an Ingersoll, the others, Rand.

The number of tons of rock stamped during the year 1882 was 45,355, from which was obtained 401 tons and 105 lbs. of mineral, which smelted yielded 293 tons and 1,500 lbs. of refined copper.

Total mining expenses for the year 1882	$77,870 36
Total stamp mill expenses for the year 1882	25,435 73
Total	$114,419 82

No estimate is made of the number of fathoms of ground broken in the mine, as part of the work is done on company account, and part on contract.

Capt. Jacka has begun to keep these estimates, and finds that in the last four months of the year the number of fathoms broken was 884. Reckoning 18 tons to the fathom gives 15,912 tons. There were actually stoped in this time 15,398 tons, so that there could have been but little waste. The result for these months would not vary much the rest of the year.

The breast stopes, which really include the drifts, cost, per cubic fathom, $14.50; the back stopes cost per cubic fathom, $12.50. This is what the men are paid, and from it are deducted the cost of supplies which the company furnish and charge to the men. The men make at these rates $53 per month of 26 days to the month. Trammers receive per month, $44, the company supplying all tools, etc. The men employed in passing dirt receive $37 per month. The total force employed at the present time (January) is 150 men.

The mine is in Sec. 14, T. 58 N., R. 31 W., and the original company was formed in 1845 and began work in 1846. All of the company's mining work has been done north of the Greenstone. The following shows the product of the Copper Falls mine in past years.

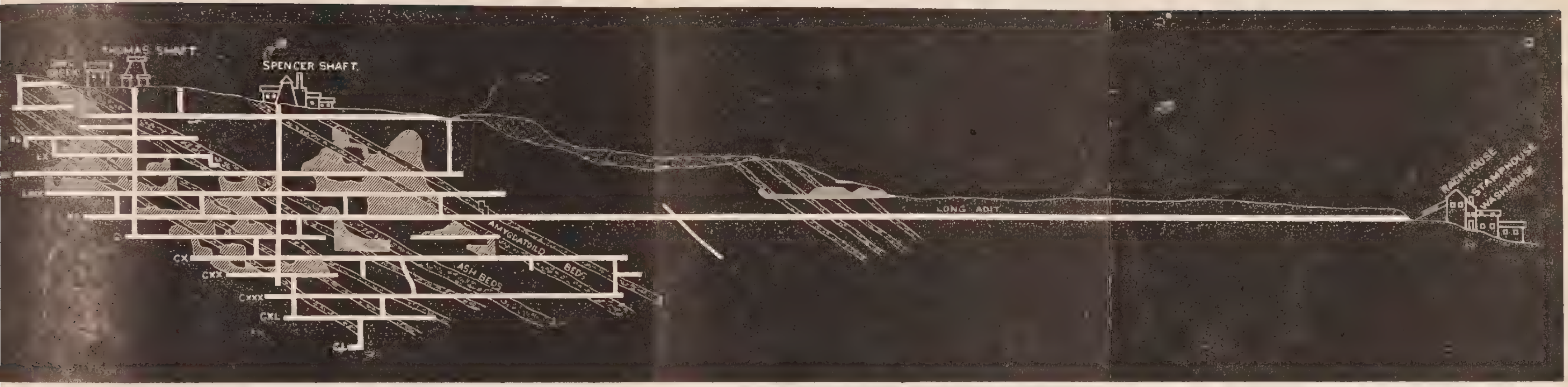
Years.	Tons.	Pounds.
Previous to 1855	158	----
In 1855	100	----
1856	104	10
1857	153	1,305
1858	151	1,852
1859	173	174
1860	255	818
1861	280	11
1862	229	299
1863	159	1,348
1864	179	808
1865	235	----
1866	568	1,169
1867	1,128	1,485
1868	239	1,384
1869	345	1,400
1870	386	990
1871	239	883
1872	260	862
1873	643	540
1874	535	359
1875	203	1,587
1876	8	1,488
1877	5	1,950
1878	5	1,790
1879	----	----
1880	3	645
1881	334	1,121
1882	293	1,500
Total product	7,382	1,778

The officers are David Nevins, Jr., President; John Brooks, Secretary and Treasurer. Office, Boston, Mass. Mining Agent, B. F. Emmerson; Wm. Jacka, Mining Captain, Copper Falls, Mich.

Capital stock of the company, 40,000 shares; par value, $25 per share; assessments made, $15.50 per share; dividends paid, $2.50 per share.

LONGITUDINAL SECTION OF THE COPPER FALLS MINE, JAN., 1883.

Scale, 500 ft. to one inch.



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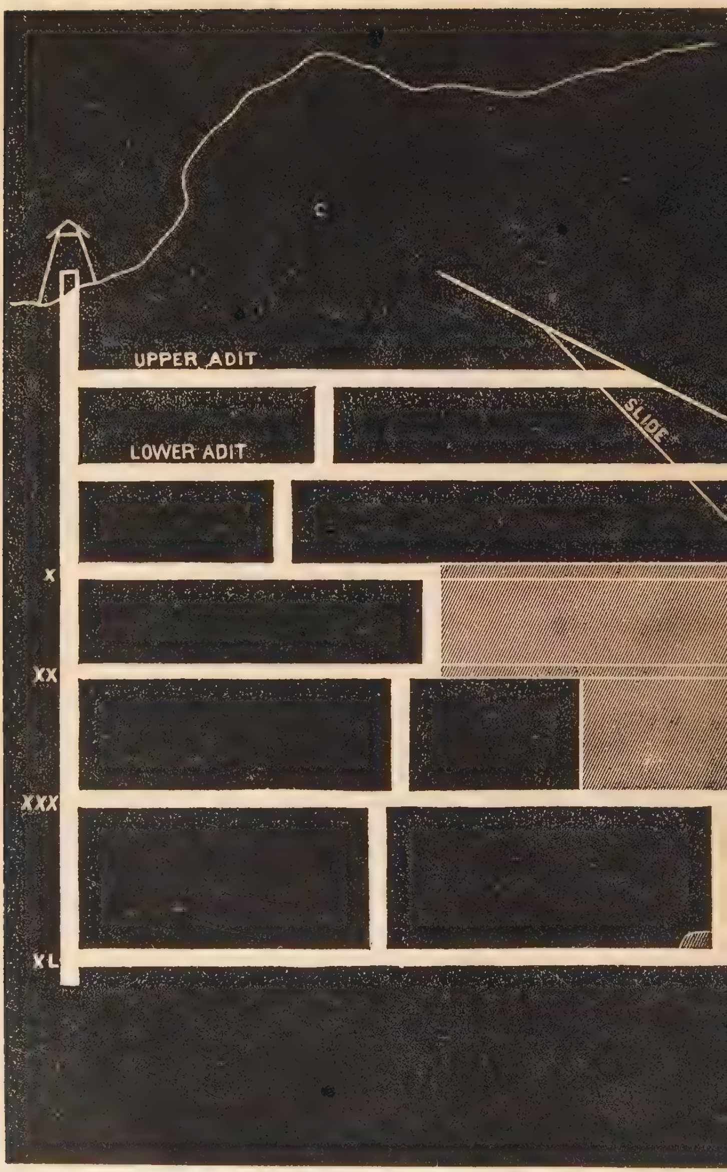


NE, JAN., 1883.

to one inch.

THE ASH BED MINING COMPANY.

This company was formerly known as the Petherick. The mine joins the Copper Falls mine on the west, and was once a part of that company's estate. The new company has been experimenting in working up the ash bed rock by using rollers instead of stamps. A somewhat full description of the plant was given in the commissioner's report for the year 1881. The work was merely a trial of the method of treating ash bed rock with grinders and rollers; a small mill was built, and they have treated about 20 tons per day for a year, saving from three-fourths per cent to one per cent ingot copper. The machinery makes very little fine copper—No. 4. The work was stopped in November last, and nothing now is doing at the mine. The rock was taken from the ash bed above an adit that comes out on the surface of the stope at a short distance from the mill. It is in a fissure—the Old Hill vein mine—that in times past has yielded considerable copper. Capt. Uren worked the mine on tribute years ago, and it is said made a good deal of money. The company has decided on no plans for the future. The mine is north of the Greenstone, but a short distance west from the Copper Falls. The estate comprises 1,100 acres of land, and the capital stock is $1,000,000, divided into 40,000 shares. The officers are Wm. P. Hunt, President, Wm. C. Coffin, Secretary and Treasurer. Office, Boston, Mass. M. A. Delano, Agent, Copper Falls, Mich.

The product of the Petherick—Ash Bed mine—is as follows:

Years.	Tons.	Pounds.
1862	15	1,382
1863	66	1,133
1864	25	1,228
1865	4	1,169
1868	6	-----
1872	5	570
1873	6	1,348
1874	86	291
1875	76	946
1876	42	1,224
1877	7	633
1881	12	804
1882	36	686
Total	391	1,864

ST. CLAIR COPPER COMPANY.

The St. Clair mine still continues to work. During the past year the incline shaft on the false slide has been sunk from the 4th to the 5th level, and the latter drifted to the north 100 feet. Some stoping has been done in the 4th level. The car runs up the incline shaft to the 4th level, and along it to the foot of the shaft, where it is dumped into the skip. The upright shaft will not be sunk any deeper, but will continue to extend down the incline. The upright shaft is too far from the greenstone, while the incline will keep nearly parallel with it. The vein—which is a fissure south of the greenstone—is in the upper levels, generally about 18 feet in width, but in the bottom where they are now working it has a width of five feet. It is not, however, greatly productive; it affords very little stamp rock and few masses, the product being mostly barrel work. Five hundred and fifty-six tons of rock were stamped during the summer, which yielded 57,680 pounds of mineral, or 24 4-10 per cent. The total yield was 110,360 pounds of mineral, which smelted, gave 78,749 pounds of refined copper. The force employed consists of 12 miners and 8 laborers. The contract miners average $48 per month, and the laborers average $40 per month. No assessments have been made during the year. The expenditures aggregate about $20,000, and the sum has been obtained from the sales of copper produced.

The mine is too short. They have not opened very fast, but since, during the past year, a Norwalk compressor has been added to the plant, so that air drills can be used, the mining work will be pushed with greater rapidity. The product is all from the vein; no amygdaloid or conglomerate beds have been cut that have shown any amount of copper.

A longitudinal section of the mine is herewith given that shows the workings to the present time (February, 1883).

The estate comprises 133 acres, adjoining the Phœnix mine on the east, in Sec. 24, T. 58, R. 33.

Office in Boston. John Brooks, Secretary and Treasurer. M. A. Delano, Agent, Phœnix, Mich; Jos. E. Stevens, Mining Captain.

Product of the mine is as follows:

Years.	Tons.	Pounds.
1865	4	815
1866	31	200
1867	43	1,783
1868	65	665
1869	23	197
1872	9	72
1873	40	1,867
1874	2	1,700
1880	6	1,195
1881	62	1,493
1882	43	1,126
Total	333	75

THE PHŒNIX COPPER COMPANY.

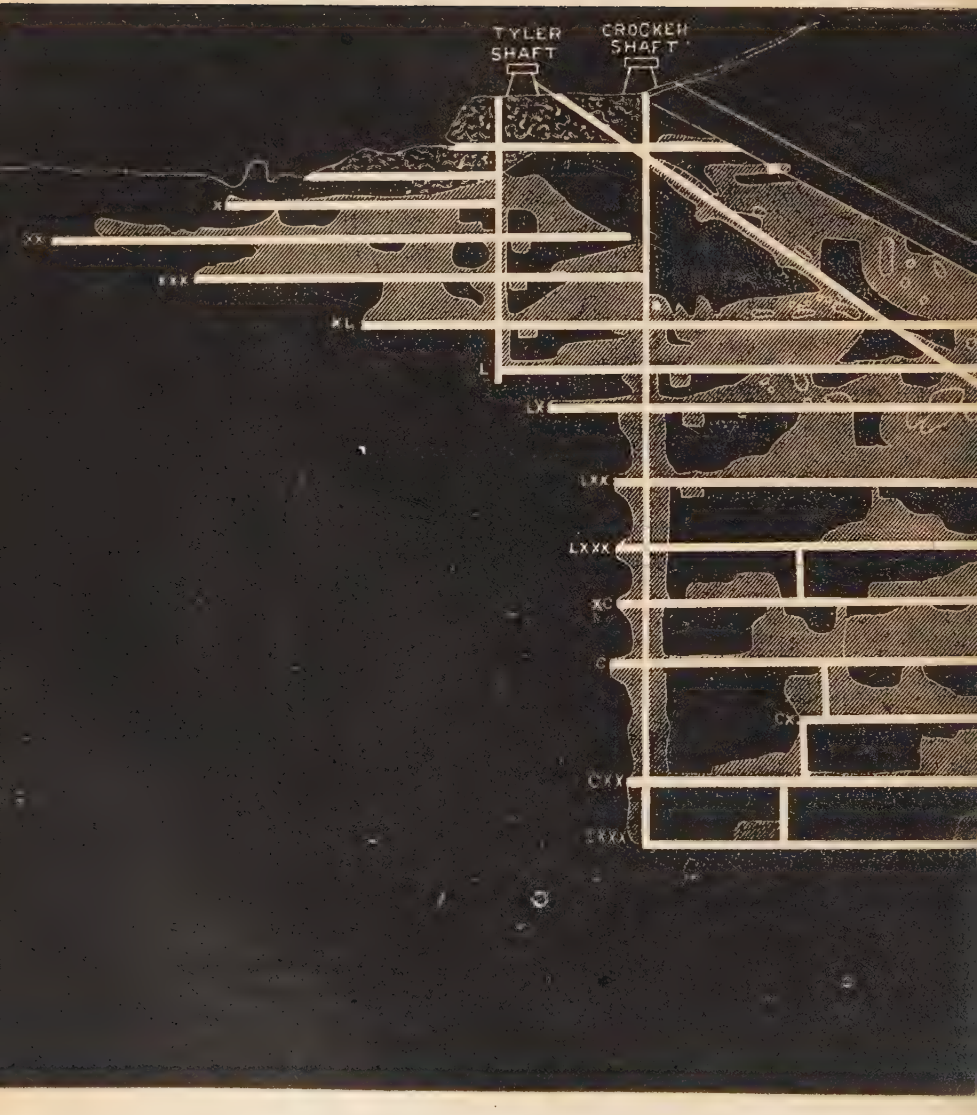
The outlook at the bottom of the Phœnix mine is an encouraging one. There is more ground opened than there was a year ago, and apparently it will be profitable to stope. In the 150 level is a block of ground 600 feet long from the incline shaft south, which is opened and is likely to prove good, as it did in the level above, and those also in the winze that is sunk at the south end of it to the level below. They have this block of ground now opened to stope on. The incline shaft is sunk to the 160 level, and a cross-cut 25 feet to the east to the vein. In the 150 the shaft is in the vein, but in the 160 the vein is 25 feet to the east. From the end of this cross-cut they will drift north and south in the vein; to the north to get under the block of ground where the copper was found last spring; the bottom is good in the 150. In this level to the north, recently in removing what appeared to be a small piece that was found to be in the way of laying the track; it was found necessary to dig about it, and it proved to be a 25-ton mass of copper. They will drift under this ground in the 160, and take it out by back stope; and will also drift south and in the same manner, back stope the block of the vein between it and the 150 level, so that the mine shows great improvement over what it did a year ago, both in the amount of stoping ground and in the probable yield of copper.

The mass in the 150 level that was described in the last report proved to be a slab of copper having considerable surface extent but not much thickness; but it may prove to have been connected with heavier copper in the bottom. A conglomerate belt which crosses the fissure develops somewhat singularly. When first seen in the 100 level it was a mere clay seam, but in the 140 level it is six feet wide; in the 150 it becomes eight or ten feet wide, but does not carry copper so far of any consequence.

The product of the mine in mineral for the year was 654,350 pounds, which,

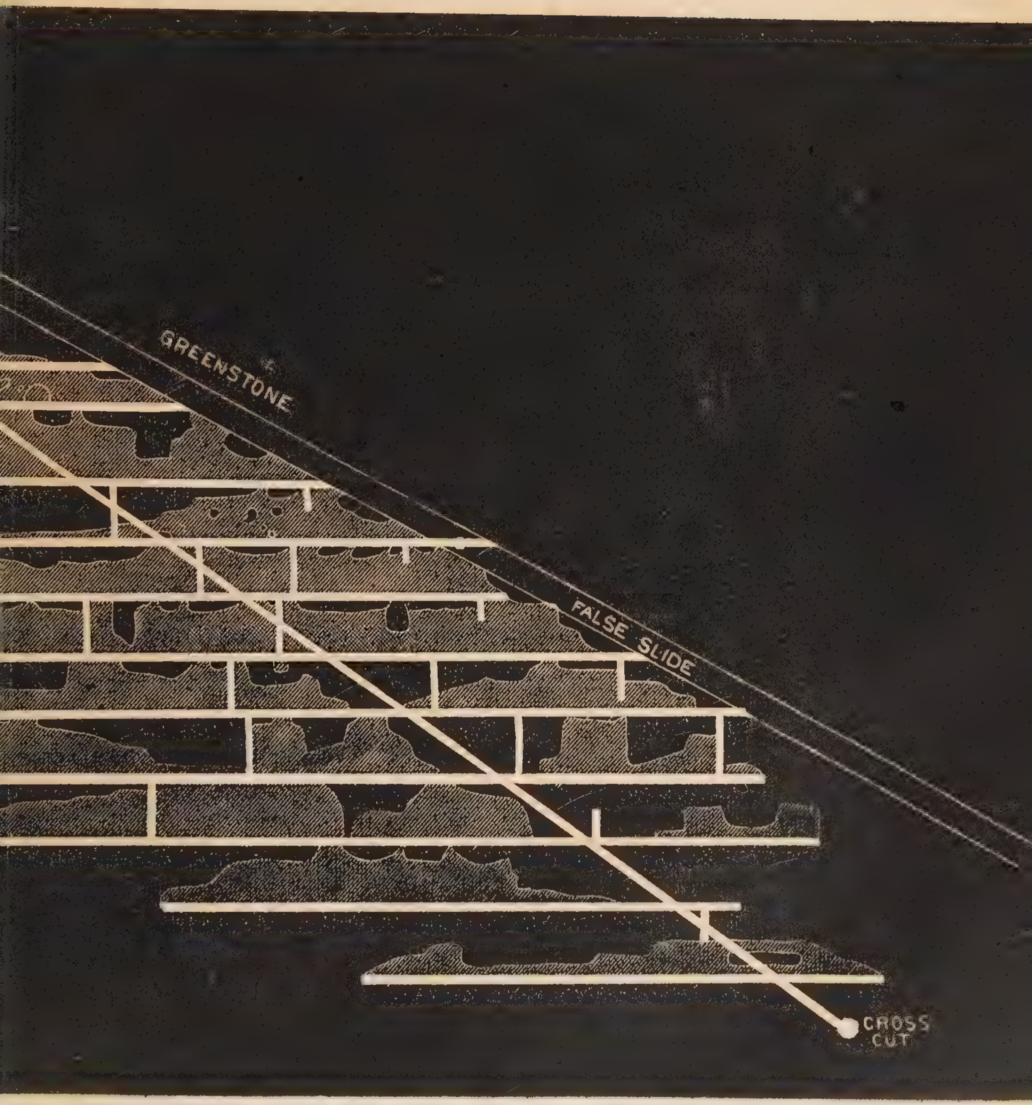
LONGITUDINAL SECTIO

Scal



PHŒNIX MINE, JAN., 1883.

to one inch.



smelted, gave 537,137 pounds of refined copper, an increase over the product of the preceding year.

The yield of ingot copper per fathom of ground stoped was, pounds	450
No. of feet of sinking done was	231.6
“ “ drifting “ “	959.4
“ fathoms stoped (superficial fathoms) was	1,144.64
“ tons of rock hoisted was	30,205
“ “ “ stamped was	9,121

The vein was narrow, and a good deal of the side walls of the vein had to be removed to work the vein.

The average cost per foot for sinking was (shafts, hand labor)	$24.01
“ “ “ “ “ “ “ with power drills was	$17.59
“ “ “ “ “ “ drifting with hand labor, drifts 6′ x 6′	$8.20
“ “ “ “ “ “ “ “ power drills, drifts 6′ x 7′	$6.11

These prices include cost of supplies, or profits on supplies.

The hand drill stoping cost per superficial fathom	$15.29
“ power “ “ “ “ “ “	$14.00
The average number of miners employed was	54
“ “ “ trammers “ “	9
“ “ “ employés for the year, including all laborers was	153

The trammers receive a certain price per skip load, 25 cents, and take the whole mine; they take the ore from the stopes to the shafts. There are only two drills stoping; two-thirds of the work is with hand drills, as the vein is narrow, and it does not pay to carry the drifts so wide as it would be necessary to do with power drills. As much as is possible of the rock is left on the stulls in the mine.

Contract miners receive on an average, per month	$48.51
“ trammers “ “ “ “	$43.83
Surface laborers “ “ “ “	$38.00

Some addition has been made to the machinery, a Norwalk compressor, same size as the new one also got at the National Mine; two new boilers, put in at the stamp mill, costing in the aggregate, with balance of construction account, $20,000. The total expenditures for the year 1882 were $117,342.25.

The work at the B shaft in the ash bed, north of the bluff, has been discontinued. No assessment has been made during the year. The number of shares is 40,000; par value, $25.

The Phœnix is the successor of the oldest copper company on Lake Superior. The first organization was made February, 1844, and the original association and its successors have prosecuted mining work on this location, continuously, since. No company has worked more persistently, or had a more checkered career. It has several times exhausted its capital stock, and re-organized.

For a period of nearly 40 years it has worked, paying assessments and hoping for dividends that never came. The company have opened mines on the estate in the ash bed and in fissure veins, but all have, to a greater or less degree, proved a disappointment. It has had periods of prosperity, when the product of the mine was large, but the surplus was dissipated in working other veins that proved the reverse, and thus the profit did not, unfortunately, find its way into the pockets of the expectant stockholder. The first mines opened by the company were in the northern slope of the range; but at present the only work doing is in the Bay State mine, a fissure vein on the south side of the greenstone. A longitudinal section of this mine is shown in this report, and the workings are shown up to Jan. 1, 1883. A full history and description of the Phœnix Co. and mines are given in the commissioner's reports of 1880 and of 1881.

The product of the Phœnix mine is as follows (also is included that of the Bay State, which was in the same vein, and worked during the years 1865, '66, '67, and then passed into the possession of the Phœnix, and has since been worked by that company):

Years.	Tons.	Lbs.	Years.	Tons.	Lbs.
Previous to 1855	19	----	1869	398	930
1855	3	----	1870	499	1,040
1856	8	----	1871	609	1,802
1857	17	----	1872	364	420
1859	28	590	1873	260	1,080
1860	20	62	1874	699	400
1861	34	790	1875	702	276
1862	31	1,590	1876	698	530
1863	72	118	1877	511	493
1864	142	187	1878	150	1,172
1865*	202	1,000	1879	271	1,436
1866*	206	----	1880	218	10
1867*	155	115	1881	204	1,357
1868	130	----	1882	268	1,177
Total product				6,726	1,230

The office of the company is in Boston, Mass. Wm. P. Hunt, President; W. C. Coffin, Secretary and Treasurer; M. A. Delano, Agent, Phœnix, Mich; Richard Bowden, Mining Captain.

THE CLIFF COPPER COMPANY.

This company was organized in 1872, as fully explained in the commissioner's report of 1880, by the owners of the old Cliff mine, and it is thus the successor in the management of this property of the Pittsburg and Boston company. The Cliff was the first great mine on Lake Superior; it was the first to reveal whence were derived the erratic masses of native copper, that through so long a period had been occasionally found in the country; it was the first to pay dividends and prior to the discovery of the Calumet and Hecla it had paid the largest amount of dividend and had realized the largest returns in proportion to the expenditure of any copper mine in the country.

It may be said to have been the pioneer company of the region since it sunk the first regular mining shaft, at its first location at Copper Harbor, that was attempted on the lake. The whole amount of capital paid in by the old company was $110,905, and in 1849, four years after work was begun, the first dividend was paid, and during the succeeding 22 years, when the mine was closed down, the fortunate owners received in the aggregate the sum of $2,627,660, as the net profit of their mine—a little over 2,000 per cent on the capital stock.

It must be remembered that the capital stock represents but a small portion of the total expenditure incurred in bringing the mine to the dividend paying point; it helped support the mine until the product met the expenses; but over half a million of dollars were expended before any dividends were paid; the excessive productions of the mine prevented this preliminary cost from being a failure.

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* Includes Bay State.

The great success of the Cliff attracted wide spread attention to the country and thus, in her early days contributed greatly, by its influence, to develop the material interests of the region. But the mine finally failed to yield copper in paying quantity, and was left to fill with water. The successors of the old company soon after pumped out the water, and have since worked away in a moderate degree without meeting with such success as should even measurably make a return of the former prosperous condition.

The mine is in a fissure vein on the south side of the Greenstone, beneath which it principally extends. The vein has proved to be regular, its bearing is N. 27° W., and nearly at right angles to the formation, and in dip it is nearly vertical as an average; its width varied from almost nothing to many feet; but generally, when not expanded by the occurrence of large amounts of copper, it averaged about eighteen inches wide, the vein stone being mainly quartz, calc spar, etc. It cuts a large number of amygdaloid beds, some of which proved productive in copper and were mined out each way from the vein.

These beds or "floors" were numbered from the South Cliff towards the greenstone, and there are 18 in all. No. 9 bed, especially, was greatly productive, and was regularly mined in all the levels.

During the past year Mr. Brockway, the present agent, has kept a force exploring in this bed in the 80-fathom level, and has driven 400 feet to the east and 500 feet to the west of the vein. At the end of the last drift they intersected a vein which is about 15 inches wide, and thus have drifted in it north and south 50 feet, without, however, developing much copper. The west drift—500 feet—has cut three small veins; one, the "Gundy vein," or which is thought to be that, is 150 feet from the old vein, and they are driving in this. This east and west drift was undertaken as an exploration, as nearly all the work done in the mine of late years has been. It is 190 feet south of No. 4 shaft. The Gundy vein is small, but at the end of the drift in it, 100 feet north, it is improving, but it shows very little indication of opening up well enough to make a mine. In this exploring work three air drills have been used.

Besides this underground exploring work in the old mine, Mr. Brockway has done considerable boring with the diamond drill across the formation to the south; an aggregate length of 2,000 feet of holes has been thus made, and they have gone through what they believe to have identified as the Calumet and Hecla, and the Kearsarge conglomerates, and the Osceola and Kearsarge amygdaloids. The conglomerate belts were narrow and not rich. The identification is based chiefly on the position of the belts. They have drilled in all ten holes, varying in depth from 105 feet to 365 feet. They are bored at right angles to the formation, and so as to prove the successive belts.

One mile to the east of the old mine, on the southwest quarter of Sec. 31, and the northwest quarter of Sec. 6, T. 57, R. 32, they have lately begun to open a new mine in a fissure vein that bears N. 27° W., and is known as the Vaughnsville vein. The No. 1 shaft is near the north line of section 6, and 700 feet east from the section corner; it is now down 100 feet in depth.

No. 2 shaft is 500 feet further north, and has been sunk 65 feet, but it is east of the vein, and they are drifting to find it. The shaft is 4,800 feet south of the greenstone. The No. 1 shaft, started in an amygdaloid belt supposed to be the Osceola, and while going through it they took out considerable copper. Since getting below the amygdaloid the vein has not yielded so well. The bottom of the shaft is in a very firm, amygdaloid trap, too hard to yield much copper. At the first starting of this mine the vein was so rich that those interested were much elated, but just now the outlook is discouraging. It is exceedingly doubtful if the indications are sufficiently favorable to justify further prosecution of the work. In addition to the shaft, an adit has been driven from the south to each shaft.

The distance from the greenstone to the Calumet conglomerate at the Cliff, measured on the surface, is 2,364 feet; measured at right angles to the formation, it is 1,290 feet; from the Calumet to the Kearsarge conglomerate it is 1,866 feet, making the latter 3,081 feet south of the greenstone; between these are numerous amygdaloid beds.

Since writing the foregoing I have been informed by Mr. Brockway that he has received orders to shut down March 1, 1883.

The office of the company is in Boston, Mass., No. 7½ Beacon street. J. W. Blake, Secretary and Treasurer; M. H. Simpson, President; D. D. Brockway, Agent, Clifton, Mich.; I. C. Trembath, Clerk.

Product of the Cliff mine—refined copper:

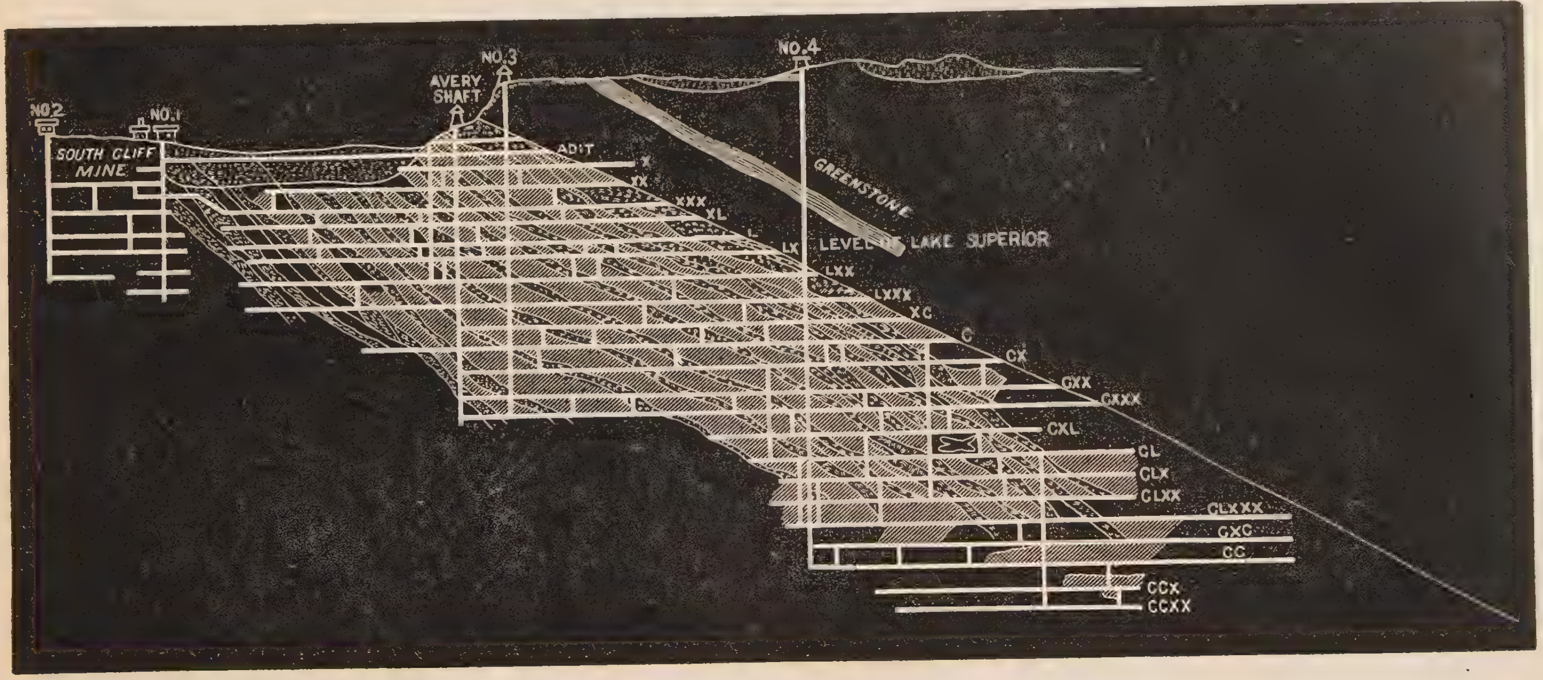
Years.	Tons.	Pounds.
Prior to 1855	3,490	-----
1855	937	197
1856	1,110	934
1857	1,180	850
1858	1,130	433
1859	707	1,007
1860	921	1,303
1861	964	11
1862	1,002	960
1863	1,050	354
1864	675	1,334
1865	747	626
1866	821	428
1867	560	1,725
1868	613	746
1869	362	1,247
1870	222	381
1871	71	238
1872	59	386
1873	375	1,203
1874	527	901
1875	581	873
1876	450	146
1877	80	1,319
1878	207	415
1879	67	336
1880	30	962
1881	39	1,382
1882	33	53
Total	19,029	340

SENECA MINING COMPANY.

The mining enterprise undertaken by this company, known as the Ahmeek, has just been pronounced by those chiefly interested to be a failure, and work has been discontinued and the machinery removed. This exploring work has been done in Kearsarge conglomerate in the N. E. ¼ of Sec. 32, T. 57, R. 32, and was quite fully described in the commissioner's last report, to which there is nothing to add. The work was undertaken with considerable confidence of a favorable result. A good deal of expense was gone to in constructing houses and other buildings. It was the intention, if the result proved favorable, to stock a company to work the mine, but it is understood now that no further attempt will be made. Nothing at all has been found on which to base any hope of making a mine. So I am informed by Capt. Daniells, under whose direction the work has been prosecuted.

LONGITUDINAL SECTION OF THE CLIFF MINE, 1882.

Scale, 600 ft. to one inch.



The officers are: J. W. Clark, President; A. F. Bigelow, Secretary and Treasurer. Office, Boston, Mass.

Capital stock of the Seneca Mining Company, 40,000 shares, $25 per share par value.

From the Cliff mine south along the range all the old mines remain idle and wholly neglected, with the exception of the Ahmeek just mentioned. No mining work has been done for many years between the Cliff and the Allouez, at the south line of the county.

THE ALLOUEZ MINE

Is worked on too small a scale to make money. It is in a poor lode—that is the percentage of metallic copper which the rock affords is low. It has been worked long enough to establish the fact that no great degree of richness need be looked for. The average is known and the problem is to mine and work up a large amount of the rock, so that there may be a sufficient product to cover expenses and leave a profit. The plant is inadequate for operating a large mine, the openings are not sufficiently extensive, and the surface arrangements are somewhat awkward for an economical working. The rock house should be in the line of the shafts instead of having a separate track to each one, and the railroad should be overhauled. It is apparently a badly located line. The grade should be reduced or more generally distributed, and the sharp curves obviated. Greater stamping and washing facilities should be provided. The mine is opened in the belt of conglomerate that underlies the greenstone along the range to the north, but here the greenstone has disappeared or become changed so that it can no longer be identified by mineral characteristics, but can only be determined from its relative position. This important copper-bearing lode has taken its name from that of the mine, and is known as the Allouez conglomerate. It is a belt in the regular formation of the country, bearing N. 39° E. and dipping northwesterly with the horizon, at this mine, 37°. The mine is in the S. $\frac{1}{2}$ of Sec. 31, T. 57 N., R. 32 W. The conglomerate belt is here very wide, made up of pebbles and fragments firmly cemented into a hard, compact mass through portions of which the copper is distributed in a moderate degree.

To give a general description of the mine, commencing with the southerly shaft, which is number one, it is 730 feet deep, but no work has been done in it since the resumption of work by the company. Number two is 600 feet to the north of it, and is the main working shaft of the mine, it is now down to the 14th level, 1140 feet from the surface measured on the lay. The bottom lift was sunk during the past year, and from the 9th level down more or less stoping has been done. The 10th level, in which they are now driving north, has been extended during the year 420 feet. They are also driving and stoping in the 14th level. The main working has been to the north of number two, from the 9th level down. From the 9th to the 12th, they have gone north past number three shaft. Number three is 600 feet north from number two, and has been sunk to the 9th level, 740 feet from the surface. The 10th, 11th, and 12th levels extend north of the shaft, but are not holed to it. This ground to the north of number two shaft, and below the 9th level, so far as they have worked it has proven good, and the work will be pushed in that direction. The vein is mined out for 14 to 24 feet wide from the foot towards the hanging, according as it carries copper. A few feet is left against the hanging wall nearly always, as additional security.

No connection is made above the 7th level between number two and number three shafts and nearly the only work done in the latter shaft was in the 3d and the 4th levels. In the 2d level a drift was run to the north 300 feet, and connected with the surface by a winze; the only hoisting done in number three at the present time is from the 7th level. The shaft, however, will be soon opened down to the 12th level and provided with a skip road. This will relieve from the pressure of work at number two, through which almost the entire work of the mine is now done. When a share of the work is distributed to number three, a larger output may be easily secured with far greater ease and safety than is now possible. The mining system, which is practiced, is similar to that followed at the Atlantic. They do not extend the drifts much beyond the stopes. With power drills a drift can be extended with great rapidity, and if pushed too far beyond the stopes and the bottom made and laid with track, etc., they are liable to be impaired by the subsequent stoping. They find it to be more convenient and sufficiently expeditious to keep the drifts only a short way beyond the stopes. The main copper "shoot" is limited to the south by the crossing which it follows down. South of this crossing the ground is all broken up and gives very little copper. The water is raised to the 7th level and thence runs to number one, where it is raised to the surface; all the water from the mine is raised in this shaft.

There is a block of very good ground standing under the 7th level and south from No. 3 shaft, which extends down to the 9th level. It includes the main copper "shooe," which, by inspection of the accompanying map, will be seen to be a long one from the crossing south of No. 2 to the ends of the drifts north. The copper ground seems to have lengthened, and it may continue to do so. The product of the mine for the year 1882 was 1,149 tons, 1,425 pounds, which smelted gave 841 tons, 1,557 pounds of refined copper—73 256-1000 per cent.

The number of tons of rock stamped was	97,232
The number of tons of rock hoisted was	112,892
Number of pounds of mineral to the ton of rock was	20 4-10
Number of pounds of ingot to the ton of rock was	14 91-100
Number of tons of rock per day equal to capacity of mill	330
Total cost per ton of rock, exclusive of construction account	$2.25 6-10
Number of feet of shafting sunk was	327 4-10
Number of feet of winzes sunk was	54
Number feet drifted for stopes	1,498 4-10
No. of feet drifted for pillars	51
No. of cubic fathoms stoped, rising stopes	813 7-10
No. of cubic fathoms stoped, breast stopes	4,944 4-10
Cost per foot for drifting, power and hand drill work	$11 71
Cost per foot for sinking, power and hand drill work, shafts	26 96
Cost per foot for sinking winze, power and hand drill work	13 86
Cost per fathom for rising stope	8 64
Cost per fathom for ordinary stope, with power drill	8 05
Cost per fathom for ordinary stope, with hand drill	10 88
No. cubic fathoms of ordinary stopes, with power drill, broken	2,324 9-10
No. cubic fathoms of ordinary stopes, with hand drill, broken	2,014 3-10
Average No. of miners employed	91 1-2
Average No. of men employed, total force per month	283 4-10
Average No. of men employed underground, total force	172 2-26

The latter includes miners, trammers, timbermen, etc.

Average wages of miners on contract per month, $49 95.

The trammers are paid by the skip, 25 cents per skip load; they are divided into parties, and change about so that each party has its turn at tramming in each level from different stopes. The mine does not afford mass or barrel work. The product all comes from the stamp mill.

A new Rand compressor has been added to the plant during the year. Heretofore they used two Burleigh, one of which is still run to some extent; the Rand, however, will suffice; also have been added 8 new drills, making 12 in. all now used.

Total running expenses for the year were:

Mining	$254,736 34
Construction account	19,347 05
Total expenditures	$274,083 39

Assessment made per share, fifty cents (40,000 shares), $20,000; railroad expense per ton of rock, transported 2¼ miles, 13 6-10 cents; which latter includes cost for repairs on the railroad, and also cost of using teams in transportation when the locomotive was out of repair.

Average cost for hoisting per ton of rock	18 3-10 cents.
Average cost for stamping per ton of rock	55½ "
Average cost for selecting, tramming, breaking, etc., per ton of rock	23 3-10 cents.

Some repairs and additions to machinery, etc., have been made at the stamp mill; a new Worthington compound pump has been added to raise water for the stamp heads, etc. There are two Ball heads and it is contemplated to add a third one; some new washers have been also added.

A new locomotive will soon be procured to replace the one now used, which is nearly worn out, and was never equal to the work. The railroad has a grade of 119 feet to the mile, and a sharp curve occurs in this grade, so that during such a winter as the present proves to be it is found to be very difficult and expensive to keep the mill supplied with rock; a body of laborers are kept almost constantly at work shoveling snow from the track; even then it is very discouraging.

The following table shows the product of the mine in past years:

Years.	Tons.	Lbs.	Years.	Tons.	Lbs.
1869	1	1,575	1878	565	1,146
1873	10	1,163	1879	715	1,452
1874	504	130	1880	659	471
1875	692	1,574	1881	736	1,007
1876	780	1,785	1882	841	1,557
1877	650	279			
Total				6,159	232

The officers are: John Stanton, Secretary and Treasurer, 76 Wall street, New York; Wm. C. Stuart, President; Fred. Smith, Agent, Allouez, Mich.; N. B. Roscorla, Mining Captain.

THE ALLOUEZ MINE.

ANNUAL REPORT.

The directors present the following statement of the business of the company for the year 1882:

The product of the mine was 2,299,445 pounds of mineral, yielding 73 22-100 per cent, or 1,683,557 pounds of refined copper, for which—estimating the copper on hand at the close of the year at eighteen cents per pound—has been realized the average price of about 17 86-100

Cents per pound, or			$300,818 19
The working expenses at the mine as per detailed statement herewith were		$253,168 34	
ADD.			
Freight	$8,332 08		
Smelting	22,351 63		
Commission and brokerage	1,683 75		
Marine insurance	801 12		
Fire insurance	52 95		
Storage, etc	214 25		
Expenses	5,698 05		
Interest	247 56		
		39,381 39	
Making the total working expenses			$292,549 73
And showing a profit of			$8,268 46
There has also been expended in construction of buildings, machinery, etc., as per statement appended		$19,347 05	
And for purchase of real estate		1,000 00	
			20,347 05
Making the total expenditure in excess of production			$12,078 59
The surplus brought forward from 1881 was			87,120 74
Leaving a net surplus, December 31, 1882, as per detailed statement herewith, of			$75,042 15

The mine work during the past year has been conducted with the object of opening the northern part of the mine and bringing another shaft into operation, while maintaining at all times a full supply of rock for the stamp mill. Fair progress has been made with this work of development, the particulars of which are set forth in our agent's report.

The foregoing figures show that a small profit has been realized over all expenditures, excluding "construction" account, which embraces only new appliances. This result may be considered encouraging, has it has been obtained while prosecuting a large amount of "dead work," which has materially increased the current expenses. The average yield of the rock mined during the year has been exceptionally low, which may be partly accounted for by the unusual amount of exploring work performed, in which no selection of ground was practicable, and much of the material thereby produced, while poorer than the average, was still too good to be discarded after the expense of mining had been incurred. The average yield having been lower than we have heretofore met with, we may reasonably expect better results in the future.

The inadequacy of our locomotive to perform the work required of it has been a serious drawback, causing frequent delays and considerable expense, especially when the railroad has been encumbered with snow. We could not procure one suitable for our work in time for shipment last season, but an engine of sufficient capacity to meet any probable want is now building for us and will be forwarded when navigation opens.

The "power drilling" machinery provided during the year has been very effective, and it is our intention to complete the outfit of this kind of machinery during the coming summer, so that "hand drilling" may be entirely dispensed with.

We have purchased 80 acres of land adjoining the stamp mill, which for several years past had been the subject of litigation, on account of the flowing of our stamp sand thereon. The purchase of this land for the sum of $2,000, terminated the litigation, without the payment of any costs. We have charged "wood and timber" account with $1,000, the estimated value of the timber on the land, which is immediately available, leaving only $1,000 to be charged to "real estate," as shown above.

As the greater part of the surplus assets consists of supplies in constant demand for mine use, any material diminution of which would cause serious embarrassment in working, the directors have been compelled to call on the stockholders to provide the means of payment for the machinery and improvements named, and others which are contemplated, and designed to increase the output, or tend to economy in working. An assessment was therefore levied, of 50 cents per share, payable January 3, 1883.

Tables of the quantity and cost of the work performed in each department, of the operations required to prepare the product of the mine for shipment, together with a summary of the results, and the mine agent's report, are also appended, and contain the details of the year's work.

By order of the directors,

JOHN STANTON, *Treasurer.*

NEW YORK, *March 13, 1883.*

ASSETTS AND LIABILITIES, ALLOUEZ MINING COMPANY, DECEMBER 31, 1883.

Exclusive of real estate and mine plant.

Assets.		
Cash		$13,309 56
Accounts receivable		486 83
Copper on hand, 396,690 lbs.		71,709 24
		$85,505 63
At Mine.		
Cash	$1,393 11	
Supplies	49,916 79	
Wood and timber (standing)	8,104 51	
		59,414 41
Total assets		$144,920 04
Liabilities.		
Agent's drafts	$17,919 34	
Indebtedness at mine	22,734 84	
Accounts payable	15,223 71	
Loan account	14,000 00	
		69,877 89
Balance of assets		$79,042 15

STATEMENT OF EXPENDITURES AT THE ALLOUEZ MINE FOR THE YEAR 1882.

Underground Expenses.

Sinking shafts 327 4-10 feet, at $26 93		$8,817 70
Sinking winzes 54 feet, at $15 00		810 00
Drifting 1,448 4-10 feet at $11.71,	17,546 75	
Drifting for pillars 51 feet at $13.86	706 95	
Raising stopes, 513 7-10 fathoms, $8.64	7,084 85	
Stoping (power drills), 2,324 9-10 fathoms at $8.05	18,716 15	
Stoping (by hand) 2,619 3-10 fathoms at $10.88	28,518 10	
Sundry contracts	1,038 90	
Mining captains, timbermen, trammers, blacksmiths, and other laborers	37,966 14	
Supplies used on company account	7,543 03	
Cost of running compressor and power drills, including repairs	10,370 51	
	$139,069 08	
Less profit on supplies sold contractors	8,846 00	
		$130,223 08

Hoisting Expenses.

Engineers, firemen, mechanics, etc.	$7,069 01	
Fuel	9,860 80	
Wire rope and other supplies	2,664 64	
		19,594 45

Selecting and Breaking Rock.

Mechanics and laborers	$14,016 58	
Fuel	4,835 60	
Castings and supplies	3,788 75	
Teaming	57 85	
		22,698 78

Surface Expenses.

Superintendence and wages of mechanics and laborers	$8,808 26	
Supplies used	1,550 50	
Teaming	501 43	
Rent of telephone	51 20	
Taxes	2,495 00	
Surveying	335 83	
Insurance	1,512 41	
Sundry expenses	656 07	
	$15,910 80	
Less sundry credit items	4,168 57	
		11,742 23

Railroad Expenses.

Engineers, mechanics, and laborers	$5,585 11	
Fuel	2,051 20	
Rails, ties, supplies, and repairs	4,596 83	
Teaming	970 61	
		13,203 75

Tons rock transported, 97,232.

Stamp Mill.

Labor and superintendence	$20,396 03	
Fuel (7528¾ cords wood)	24,470 91	
Supplies	3,589 36	
Foundry bills, etc.	5,531 47	
		53,987 77

Rock stamped, 97,232 tons.
Rock stamped per cord of wood, 12 9-10 tons.
Cost of stamping and washing, 55 52-100 cents per ton.

Mineral Expenses.

Transportation to Hancock	$3,783 96	
Barrels and cooperage	894 45	
Assaying	350 00	
		$5,028 41
		$256,478 47
Less rents received		3,310 13
Net working expenses		$253,168 34

Construction Account.

Trestle road, from No. 2 shaft to rock house	$1,916 43	
Trestle road, from rock house to waste dump	349 16	
Stone compressor house, with slate roof	2,019 73	
One side Rand duplex compressor (16½x30), freight and labor	5,752 91	
Eight Rand drills and hose	3,628 00	
Worthington compound duplex pumping engine at stamps, and additional washing machines	3,000 84	
Boilers at No. 2 engine house	1,701 62	
Putting in boiler at No. 1 engine house	313 36	
Winding engine, underground	283 00	
Knowles's pump, underground	382 00	
		19,347 05
Total expenditure		$272,515 39

SUMMARY OF RESULTS.

Tons of rock mined	112,892
Tons of rock hoisted	107,079
Tons of rock treated at mill	97,232
Refined copper per ton of rock mined	14 91-100 lbs.
Refined copper per ton of rock milled	17 31-100 "
Refined copper per fathom of ground broken	256 "
Total yield of mineral	2,299,445 "
Total yield of refined copper	1,683,557 "
Cost of mining per ton of rock milled	$1 33 93-100
Cost of hoisting, per ton of rock milled	20 15-100
Cost of selecting and breaking, per ton of rock milled	23 35-100
Cost of general surface expenses (less rents) per ton of rock milled	8 67-100
Cost of transportation to mill, per ton of rock milled	15 58-100
Cost of stamping and separating, per ton of rock milled	55 52-100
Cost of expenses on mineral, per ton of rock milled	5 17-100
Total net working expenses, per ton of rock milled	2 60 37-100
Total net working expenses, per ton of rock mined	2 24 26-100

AGENT'S REPORT.

ALLOUEZ MINE, L. S., MICH.,
January 20, 1883.

John Stanton, Esq., Treasurer Allouez Mining Company, New York:

DEAR SIR,—I herewith submit my annual report of operations at our mine for the year ending December 31, 1882.

No. 2 shaft has been sunk 110.3 feet, from the 13th to the 14th level. The same kind of vein matter, carrying about an equal quantity of copper, has been met with, as in former lifts. The drifts north and south from shaft, advanced respectively 26.5 and 22 feet, have opened into a fair vein. No stoping has been done yet at these points.

The 13th level north of No. 2 shaft, has been advanced 160.4 feet, total length 242.4 feet. This drift has opened fair stoping ground, and considerable stoping has been done, with satisfactory results. The same level has been advanced 24 feet south from shaft, total length 102 feet. The head of the drift has intersected the crossing, and further driving has been discontinued. The entire block of ground, from shaft to crossing, has been stoped down, and gave a moderate yield of copper, yet it did not turn out as well as in the levels above.

The 12th level north of No. 2 shaft, has been advanced 198.8, total length from shaft 523.9 feet. At about 50 feet from shaft, a winze was sunk 40.6 feet, to connect with a rising stope from the level below. A large portion of the vein has been poor, and the stopes, in such parts as carried copper, have not yielded as well as we expected. The yield in the level above, in the same run of ground, was much better. The leanness of the vein in this level had a marked influence on our product the past year.

The 11th level north of No. 2 shaft, has been advanced 205.3 feet, total length from shaft 642.3 feet. At a distance of 325 feet from shaft a winze was sunk 13.4 feet, to meet a rising stope from 12th level. With the exception of a few short bars of poor ground, the drift has shown good copper ground all the way, and the present breast—which is past the line of No. 3 shaft—looks exceedingly well. Considerable stoping has been done in this back, with satisfactory results.

The 10th level north of No. 2 shaft has been advanced 97.1 feet, total length from shaft 694 feet. The vein drifted through the past year has shown very well, and the stopes yielded a fair quality of stamp rock. The breast of this drift is also past the line of No. 3 shaft, and looks very well. This level south from No. 2 shaft has been advanced 112 feet, total distance from shaft 554.2 feet. At several points the drift has been carrying considerable copper, but a thorough test by trial stopes has proved unsatisfactory. The copper seemed to be confined to bunches, of not sufficient magnitude to pay for stoping. The vein for the last 90 or 100 feet, has been intersected by several crossings, and frequent heads or slips, giving it a very unsettled character. I deem it advisable to carry this drift further south, being strongly of the opinion that we will soon meet with more favorable ground.

The 9th level north of No. 2 shaft has been advanced 140.6 feet, and is past the line of No. 3 shaft. Total distance from No. 2 shaft 665.6 feet. The present head of drift is in nice copper ground, and the entire distance drifted the past year has been through ground fairly charged with copper. The stopes in this back yielded moderately well. A rising stope is being carried up to meet No. 3 shaft between the 7th and 8th levels.

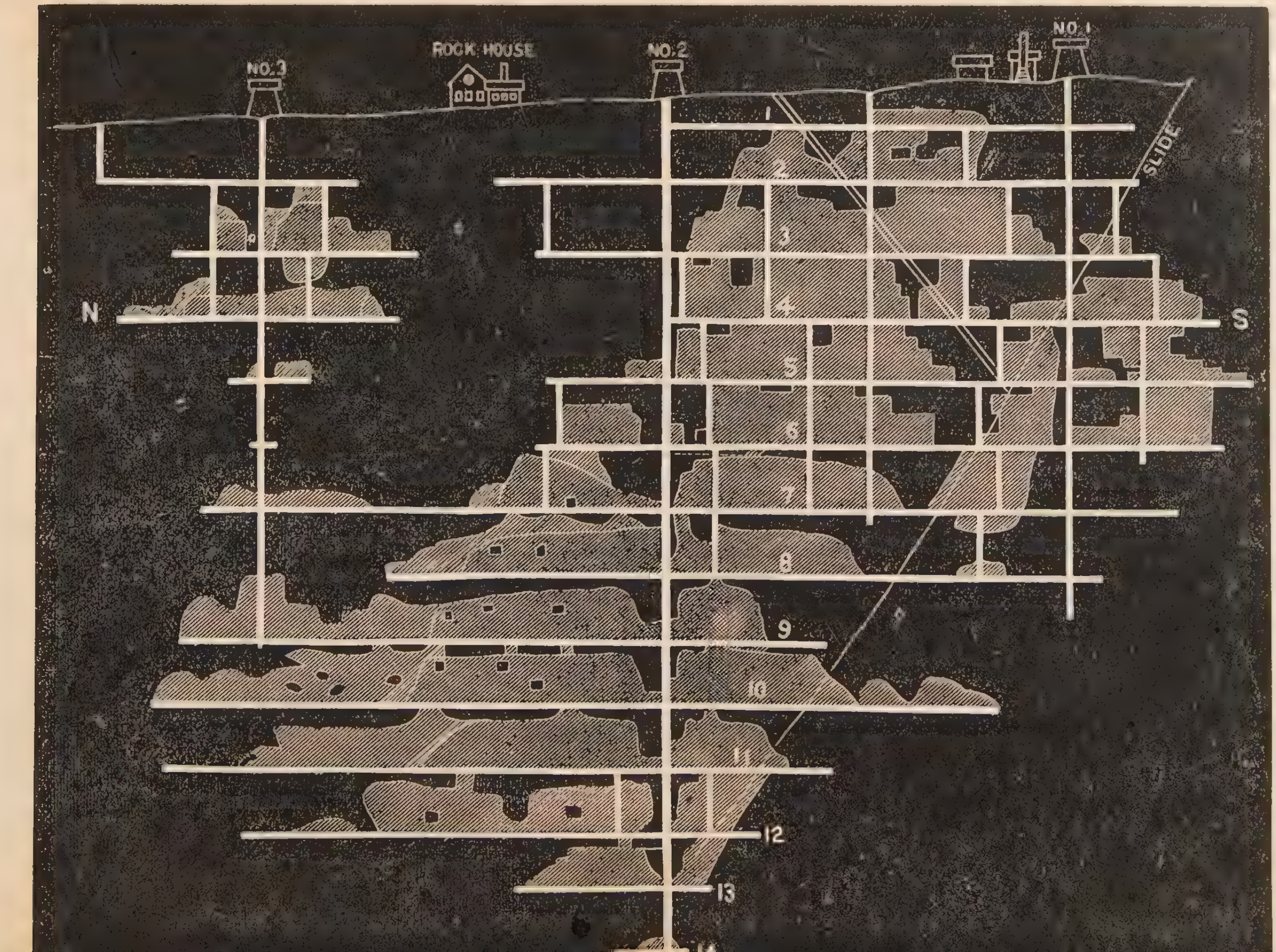
The 7th level north of No. 2 shaft has been advanced 326 feet, and connected with No. 3 shaft. For a distance of about 160 feet, and directly home to No. 3 shaft, the vein has carried considerable copper, and I think, will pay for stoping. A test will be made very soon, and should our hopes be realized, this block of ground would be valuable, as you will see that very little work has been done in it, from this level to the surface.

No. 3 shaft has been sunk 217.1 feet below the 5th level, and is now 46 feet below the sole of 7th level. For about 40 feet below the 5th level, considerable copper was met with; from thence it was poor to within 30 feet of 7th level; below this point very good copper ground was encountered to its present depth. Only a short block of ground remains between the sole of shaft and the rising stope from 9th level, and I expect to make connection ere the end of this month.

The 7th level north of No. 3 shaft has been drifted 71.8 feet. For some

LONGITUDINAL SECTION OF THE ALLOUEZ MINE, JAN., 1883.

Scale, 300 ft. to one inch.



distance the vein carried nice copper, latterly however, the drift has not shown so well.

The 6th level south of No. 3 shaft has only been drifted 8 feet, and was then discontinued.

The 4th level north of No. 3 shaft has been advanced 96.9, total distance from shaft 221.9 feet. The vein has carried but a small seam of copper, and work here has been stopped.

The ground broken during the year was

Sinking shafts	327.4 feet
Sinking winzes	54 "
Driving levels	1,498.4 "
Driving for pillars	51 "
Stoping	5,757.9 cubic fathoms
Ground broken in openings	812 " "

Our construction and additions to machinery for the past year have been as follows: 1st. New trestle road from No. 2 shaft house to rock-house. 2nd. New trestle road at rock-house for disposing of poor rock. 3rd. New dumps at No. 2 shaft house and rock-house. 4th. Repairing and placing another boiler at compressor house. 5th. New stone compressor house with slate roof, and stone foundation for machinery. 6th. One side Rand duplex compressor, 16½x30, and air receiver. 7th. Eight No. 3 Rand drills. 8th. Repairing and placing at No. 2 hoisting works, three boilers formerally in use at stamp mill; also one winding engine, and one Knowles pump underground, and a Worthington duplex compound pump, and seven new washing machines at stamp mill.

The result of operations for the past year has not fully come up to anticipations entertained at the beginning of the year. This is mainly attributable to several stoppages at the mill, occasioned by necessary repairs to No. 1 foundation, and laying up of our locomotives for three weeks for repairs, also the lean nature of the rock obtained from the 12th level north of No. 2 shaft. There is, however, charged in ordinary running expense the sinking of No. 3 shaft, casing and dividing same, cutting plat and putting in track, rising from 9th level to meet the shaft, drifting 7th level to No. 2 shaft, extra rails, ties, and labor on railroad, aside from regular repairs, amounting in the aggregate to $15,000. The opening of No. 3 shaft will prove valuable in the future, yet to the present date no material benefit has been realized.

The machinery at the mine, and particularly the new air compressor, is doing very good duty. The second half of the compressor ought to be added the coming season, which would enable us to do all our underground work with power drills. To further economize in fuel new and improved feed water heaters and a new cylinder to rock house engine will be required. The machinery at stamp mill, together with foundations, is in very good condition. The Worthington pump, placed there lately, fully realizes our expectations in point of duty and economy. The water supply has been more than ample for stamping purposes the past year. The railroad is in fair running order, yet a large number of the old rails are rapidly becoming unserviceable, and will have to be replaced by the time our new and heavier locomotive (already contracted for) will be put into service.

The underground appearance for next year's output is very encouraging, particularly that part at No. 3 shaft below the 7th level. The appearance of the openings made there warrant us in expecting good results.

The tables of costs forwarded by Mr. Raymond, clerk, will show in detail the work and expenditure in the several departments of the mine, and the plan of the underground work made by Mr. L. G. Emmerson, C. E., will convey the work and its present extent more fully to you. The survey was made about the 20th of this month and embraces the openings to that date.

In concluding it gives me pleasure to state that my associate officers have been faithful in the discharge of their duties.

Yours very respectfully,
FRED SMITH, *Agent.*

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THE PORTAGE LAKE OR HOUGHTON COUNTY MINES.

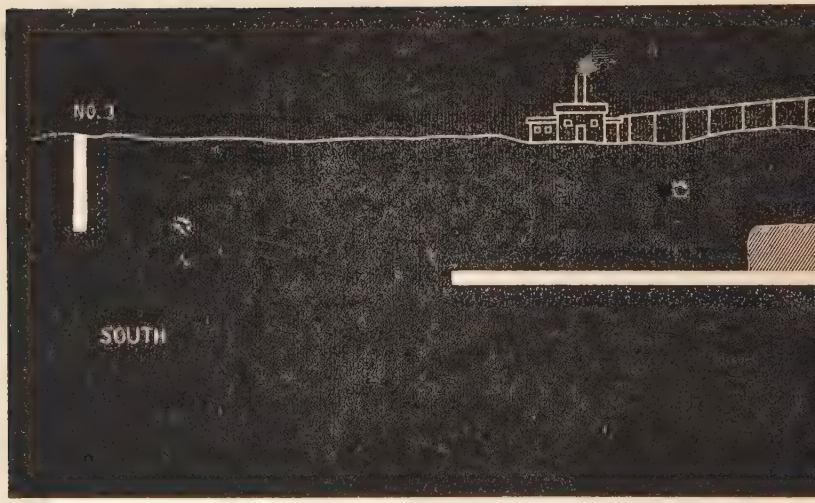
THE WOLVERINE MINING COMPANY,

Which began work a year ago with such a remarkably favorable showing of copper in No. 2 shaft, has continued its operations during the year, and still finds its outlook to be one for encouragement. The mine on this property cannot be a large one, as the extent of the lode which the company possesses is limited in length to about a hundred rods, and for this reason, probably, the operations of the company have been, comparatively, somewhat restricted. A longitudinal section of the mine is herewith shown, and the extent of the openings will be comprehended at a glance. As will be seen, there are three shafts, No. 1, the northerly one, is sunk to a depth, on the lay, 39° or 40° with the horizon, northwesterly, below the surface, 170 feet, to the second level; 385 feet to the south is No. 2, which is also to the 2d level, 185 feet. Between these shafts, 110 feet north of No. 2, is a surface winze, for air. The 2d level at No. 2 shaft is driven either way, north and south, 30 feet, and the first level extends south of No. 2 242 feet. 450 feet south from No. 2 is No. 3 shaft, sunk to a depth of 50 feet.

The lode, so far as it is opened, is exceedingly variable in character. The productive portions are very soft, friable, having a good deal of laumonite and epidote, especially along the foot wall, and holding somewhat the appearance and texture of rotten mortar. In this is contained a large percentage of fine copper. The epidote, particularly, carries very fine copper, which it will be found a difficult matter to save. In other parts, as in the bottom of No. 1 shaft, it is a hard turf with an abundance of amygdules, but with little copper. The mine is in the Kearsage amygdaloid, and when opened a year ago the lode, down to the first level, proved to be phenomenally rich in small mass and barrel work. The lode has a width of about 16 feet; in the 1st level it is broken up and irregular, but deeper it becomes more settled and uniform in its width. No. 2 shaft has a skip road, worked with a cage, and No. 1 will also be similarly pro-

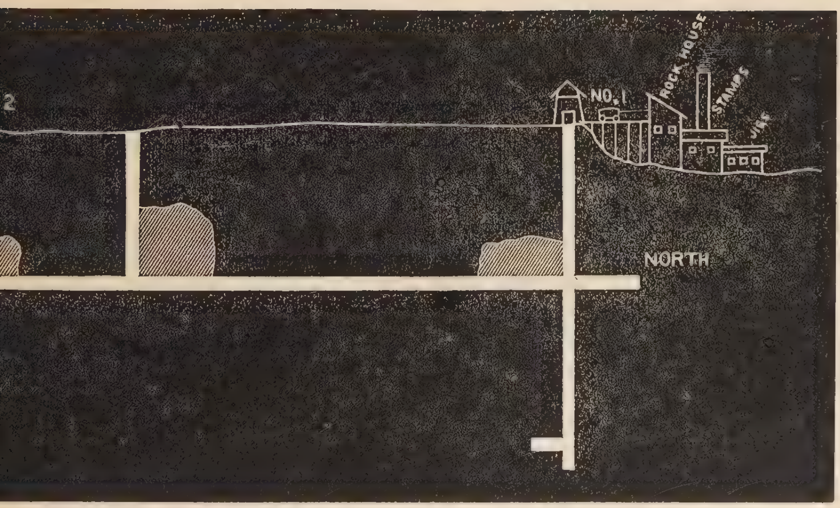
LONGITUDINAL SECTIO

Scale



ERINE MINE, JAN., 1883.

ne inch.



vided. The rock-house and stamp mill are joined together and have recently been completed, and the machinery put into operation. The situation is but 150 feet from No. 1 shaft and 450 feet from No. 2, so placed that the top of the rock-house is on a level with the track laid on the surface. The surface and interior arrangements connected with the stamp mill are very handy. The machinery contained in the mill comprises one rock-breaker, one Ball head, eighteen Collum jiggers, two steam boilers, engine, etc. The water is brought in a launder 800 feet, but it proves to be insufficient, and to supply the want a dam is now building below the mill to catch the waste water and thus to create a pond from which the water may be pumped and used over. It is possible by so doing enough water may be had to enable the company to operate two heads, and when the mine is sufficiently opened no doubt the work of two heads will be indispensable. A dernier resort will be to bring water from Trap river. A heavy fall in the river on the company's land in section 5, half a mile distant, would furnish power sufficient, it is claimed, to operate the mine.

The stamp mill started recently and is working up about 130 tons of rock per day, and the yield is about 2 per cent mineral. The slime contains a great deal of very fine copper and epidote. No tables have yet been introduced for working over the slime, but will be. Some of the rock, red oxide and green carbonate of copper, was sent to the smelting works at Portage Lake and yielded 10 to 15 per cent of copper. Considerable of this is found along the foot wall, and it was a question whether it would not be better to smelt it directly and not stamp it. An amount smelted which sold for $700, cost for doing it $100. The copper got out was of course all barrel work, 53 tons and 622 pounds of mineral, which yielded 36 tons 534 pounds of refined copper.

The mine machinery was all made at the Portage Lake foundry works. The hoisting engine and drums are adequate for present purposes. The latter are 9 feet diameter. They work a compressor and six drills. The machine has the capacity of 12 drills. The underground work is done on contract. The drifting costs $7 per running foot and the stoping the same amount per fathom. The sinking costs $16 per foot.

No assessment has been made; 10,000 shares of the capital stock were set aside to be sold for a working capital, and the avails of the sale with the copper produced has sufficed. The expenditures have been $90,000. Some frame dwellings have been built besides 5 log houses, also office, engine house, etc. The mine is in the N. ½ of the N. E. ¼ of Sec. 7, and the company own also the N. W. ¼ of Sec. 8 and the S. E. ¼ of Sec. 5, all in T. 56, R. 32. No. 1 shaft is not far from the north line. The lode dips northwesterly and bears northeasterly, both at about the same angle. No. 1 shaft, when extended down about 750 feet, will reach the limit of the property, and No. 2 shaft can have a length of 1,500 feet, and No 3 1,300 feet when it will be cut off by the west line. The distance west to the Calumet and Hecla conglomerate lode is 2,866 feet.

The capital stock is $1,000,000 divided into 40,000 shares. Office in Houghton, Mich. . T. W. Edwards, President; Edward Penberthy, Secretary and Treasurer; Richard Uren, General Manager.

THE CENTENNIAL COPPER MINING COMPANY.

The first mine on the range south of the Wolverine is the Centennial,—the S. ½ of Sec. 12, T. 56, R. 33, 320 acres,—and thus far its career has been an unfortunate one. The first organization was known as the Schoolcraft, formed in 1868, which worked in the northerly extension of the Calumet conglomerate, but met with such poor success that after exhausting its capital stock the company suspended. In 1876 a re-organization was made with a capital stock of $1,000,000, divided into 40,000 shares, and in 1880 work was resumed, openings having begun in the Osceola amygdaloid, since which time it has been continuously prosecuted. The result of this underground development is comprised in two shafts. No. 1, the north one, is now sinking to the second level, and No. 2, the south shaft, is 450 feet below the surface. The shafts are connected in the first level—660 feet,—and this level extends on south of No. 2 350 feet further, making it 1,010 feet in length. The 2d level is 300 feet north and 250 feet south of No. 2 shaft, and the 3d level is opened a distance of 150 feet each way from the shaft; the 4th level is 75 feet each way. Work in No. 1 shaft had been discontinued until recently, when the sinking was again begun, and is now looking very favorable.

Very little stoping has been done. The stamp mill was started, and the rock from the openings was worked up. The stamp mill was stopped in November, at the beginning of cold weather, and the work since doing in the mine is sinking both shafts. So far the lode does not appear to be sufficiently settled and uniform. The little stoping which has been done was in the 4th and 5th levels. The lode varies in width from 15 feet to 40 feet, and is generally a hard, dry amygdaloid, showing very little copper. In places, however, it is sufficiently rich, the copper being along the foot-wall, and again along the hanging. The stamp mill ran about four months, and worked up about 50 tons of rock per day. They run 20 hands, and the yield is given as about two per cent of mineral on an average. They are now working 20 men, using a Rand compressor and four drills. Number one shaft will be soon to the second level, and when that is reached they will drift to connect with No. 2. In the summer, when a good deal of repairing was in progress, the company employed 150 men.

In December an assessment of $2.50 per share was called to raise money to cover indebtedness and to provide for continued working. The mine produced in copper the last year, mineral, 100,016 pounds, which smelted gave 83,554 pounds refined copper.

The product in past years has been, refined copper:

Years.	Tons.	Lbs.	Years.	Tons.	Lbs.
1869	4	290	1874	5	618
1870	213	366	1882	41	1,554
1871	371	1,228			
1872	192	242	Total	983	83
1873	154	1,785			

The officers are: President, S. L. Smith, Lansing, Mich.; A. W. Jackson Secretary and Treasurer, New York; Josiah Hall, Agent, Calumet, Mich.

KEARSARGE MINING COMPANY.

This property joins the Wolverine mine on the north, and is, of course, crossed by the amygdaloid copper belt, in which the Wolverine company is now working. Some negotiations have been pending for the sale of the Kearsarge lands to the Wolverine company, but the transfer was not consumated. Recently Mr. R. R. Goodell, of Houghton, Mich., has secured an option for the purchase of the property, and has already begun the work of cleaning out the old pits, which were made many years ago, in what has since been known as the Kearsarge amygdaloid, with the intention of exploring the vein thoroughly and if the result is favorable, to purchase the land and organize a company to work the vein. The option is $5.00 per share—$100,000.

The officers of the company are: J. W. Clark, President; A. S. Bigelow, Secretary and Treasurer.

The exploring work is in charge of Captain Daniells, Agent of Osceola mine.

CALUMET AND HECLA MINING COMPANY.

The best estimate of the value of a mine is its product. Its whole history, if it has a record, is epitomized in what it has produced; no matter what the outlay has been, what preparations may have been made, and expenditures incurred, sum up the yield of copper that it has afforded, and the story is told; the matter of profit and loss must turn upon the output. In the history of copper mining on Lake Superior there have been many failures and some extraordinary successes; there have been and there are still mines which have yielded and still yield a large product, and have afforded and do afford an ample profit, but there has never been but one Calumet and Hecla. The others have a common lot, their reverses and successes are relative and comparable one with another, but the Calumet and Hecla is a thing by itself; it has little in common with its cotemporaries; its lines are cast in pleasant places, and assured of the prosperous outcome it may pursue the even tenor of its way, wholly relieved of the anxiety which is the common experience of all the other mines. Its deposit is so rich and so extensive that there is no other that may ever approximately rival it.

There are other valuable mines in the copper district, but when they are compared with the Calumet and Hecla it serves only to magnify the one and depreciate the others.

The Calumet conglomerate, which on the property of this company has proved so uniformly and phenomenally rich, was discovered in 1865, and the company made its first shipments of copper from it in the second year thereafter, since which time the output has been as follows:

Years.	Tons.	Lbs.	Years.	Tons.	Lbs.
1867	675	1,173	1875	10,736	1,954
1868	2,549	375	1876	10,845	737
1869	6,157	1,771	1877	11,284	468
1870	7,030	1,584	1878	12,625	1,128
1871	8,111	590	1879	13,135	943
1872	8,081	183	1880	15,837	1,239
1873	9,424	265	1881	15,680	781
1874	1,062	1,225	1882	16,026	1,528
Total product				158,265	1,597

Which sold at the average market price of copper for the period of sixteen years (22½ cents per lb.) would make the sum of $71,219,610.45.

To obtain this enormous product the company have, possibly, exhausted an extent of the belt which would be comprised in an area equal in extent to three forties—one hundred and twenty acres—but a limited proportion of the extent of deposit possessed by the company, if it shall continue to hold the same productive value to an indefinite depth. A year ago the company purchased the so-called Frue lands, an amount about equal to that which the mine workings have already exhausted—120 acres. The sum paid for these three forty-acre lots was one and a quarter million of dollars. It was thought at the time by some to be a great price to pay for so small an amount of land; but as it adjoins the workings of the mine, and some of the shafts and levels are already extending into it, and as there is good reason to assume that some of this ground is as rich as any portion of the mine, and all of it is underlaid by this conglomerate, and is directly accessible from the present mine workings, it becomes evident that the price paid is a mere bagatelle. In working out an equal amount of ground adjoining this purchase, and beneath which some of the same shoots of copper extend, the company has paid to its stockholders in dividends the net sum of $23,350,000. One and a quarter million dollars is not a very large price to pay for land that will do that, certainly.

The product of the Calumet and Hecla for the year 1882, as shown in the above table, was 32,053,539 pounds of refined copper, which, at 18.41 cents, the average price per pound for the year, gives for the gross income $5,901,056.53.

To obtain this product there were stamped 335,000 tons of rock, or an average of 99 pounds of refined copper to every ton of rock, which, at 18.41 cents per pound, would make the gross value of every ton of rock $18.32. What the cost is for mining a ton of the rock I do not know, but it cost the Osceola the past year $2.66¾ per ton, total cost of rock stamped; the Quincy $4.39. It cost the Atlantic $1.19; the Franklin mine $2.35. The Pewabic total cost, as with the others includes stamping, etc., $3.03.

The Osceola rock yielded 24.21 pounds of copper to the ton, worth $4.46. It mined and stamped 172,529 tons of rock, obtaining therefrom 4,176,788 pounds of copper, and paid in dividends the sum of $200,000, being a net profit of $1.15 + per ton of rock.

The Calumet and Hecla paid in dividends $6.00 for every ton of rock mined and stamped; that is 5 5-23 times more per ton than did the Osceola, leaving $12.32 for mining cost and expenses.

If its total expenses per ton of rock were only twice as great as the Osceola there would be left $13 per ton of rock for dividends, etc. If the cost per ton were three times as much, it would have left $10.33 for dividends and for other expenses. The market value of the copper obtained, per ton of rock, was $18.32; the dividends paid were $6 per ton, leaving $12.32 per ton of rock to be exhausted in the mining and construction account.

The Calumet conglomerate is a much tougher and more expensive rock to mine and stamp than the Osceola amygdaloid, but both belts have been mined by the Osceola company, and the relative cost is known. Probably the mining cost of the conglomerate need be about twice as much as the amygdaloid. The total cost per ton of rock stamped by the Osceola company, including the construction account, and all other expenses, was $2.90.

If it should cost the Calumet and Hecla $6 per ton on the same basis, there would be left, as before given, $12.32 as the profit on a ton of rock, or 12 cents per pound on the copper produced. In other words the cost of production would be in round numbers 6⅓ cents per pound. But it would seem from the dividends paid, the number of tons of rock stamped and the yield of copper per ton, that the cost per pound of copper was about 12 cents, or about the same, as the cost per pound at the Osceola; although the percentage of copper in the rock was nearly five times as great.

It may be necessary to disclaim any intention of reflecting on the management of the Calumet and Hecla in this estimate of mining cost. The comparison is undertaken as a matter of legitimate inquiry for information and instruction only. There is no doubt that the comparison of the relative cost of production at the different mines, leading into the study of the details of the causes, and the application of remedies for every undue excess of expenses, have as a result the fact that the cost has been reduced to so low a point. The construction cost at the Calumet and Hecla is, apparently, very large. A great amount of very powerful and very costly machinery has been added in the past few years, and much more is still adding or changes are making, which necessitate great expenditure.

It may be with companies as with individuals, an immense and assured income begets a seeming extravagance. At least the Calumet and Hecla, having so great a product, is not under the necessity of studying or practising the economy which is a primal requisite to success with most other companies.

The great engine at the Calumet mine was started, but it did not work successfully. The motion was found to be too great, and the bearings of the shaft became heated, melting the babbiting. The shaft is steel, 16 inches diameter, made at the Krupp works in Germany, and the balance wheels, of which there are two, are 33 feet diameter, and weigh, it is said, upwards of 40 tons each. One of them is to be used as a band wheel to run the machinery that operates the elevated tramway that connects the shafts with the rock-house.

The drums now in this building are 12 ft. diameter, and the foundation is laying for two additional ones to be 24 ft. diameter. This hoisting machinery is now operated by a Corliss engine, recently added, and a second engine in the west side of the building may be used if more power is required. The large engine is again nearly in readiness to start, and it is thought that there will be no further trouble. At first it was run up to a speed of 60 revolutions. This number will be reduced to 50. A small engine is in place to assist in starting the large one.

In the second building, south of the one containing the hoisting machinery, etc., is the pumping and man engine machinery, now run by a Corliss engine in the same building, but to be operated by the "Superior" when that is in readiness for doing its work.

A large addition has been made to the machine shop, which is of stone, and slate roof. Altogether this will be a very large and fully equipped establishment.

The large Leavitt engine at the Hecla mine is idle, and will be removed to Lake Linden to be used, in case of emergency, for pumping at the stamp mill. A thousand-horse-power Corliss has been erected to do the work of hoisting, temporarily, until the new one which is building—Leavitt's pattern—is in readiness to take its place. This new engine will be similar to the large one at the Calumet mine, and of 1600 or 2000 horse power. The 4 drums in the Hecla building are each 30 ft. diameter. There is a large duplex Rand compressor at each mine, which furnish the air for 65 drills, the number now used,—Rand No. 3. A new duplex compressor is building for the mine, 3 ft. cylinders and 5 ft. stroke, said to be larger than any now in use, probably, in the world. The cylinders are made by Rand, the frame by Delametre. This compressor will be for any emergency; it will be large enough to do the whole work of the drills, if required, and will be run by the big engine. It is found that the drills furnish air enough in the mine, and the use of the fan is not required. Some additions have been made to the mill, in which slime tables are included. The result of their use is so favorable that more will be added; only three have thus far been used, as a trial. They are enlarging the sand wheels to carry the waste farther into the lake.

The water for the boilers at the mine is pumped from the pond in Calumet creek, and into it is also run the water from the mine. The timber for the mine, of which an immense amount is required, comes mainly to the landing at Lake Linden, from the shores of Torch lake, or brought there in rafts, whence it is hauled up on the land and piled up in rows, and then loaded upon cars that by wire rope transmission are drawn upon a track to the incline, where they are drawn up to the main line, and thence sent to the mine. The coal and supplies, etc., for the mine come by water to the company's dock at Lake Linden, and thence by its own railroad are taken to the mine. The descent from the end of the main track to the lake is 355 feet. Capt. West, the company's accomplished engineer, is engaged in making a detailed topographical survey of the entire property, which will be of great value in accurately locating points, which may be used to definitely determine the relative positions of the different geological belts. Such a map, if extended over the entire "Point," would be of great service in the matter of future exploration.

At Lake Linden the company have two stamp mills, in which are eight stamp heads—six Ball and two Ball-Leavitt heads.

From one-half to one per cent of copper goes off in the waste. Here as elsewhere it is small particles of attached copper—that is, bits of the metal adhering to the waste pebbles of rock. The company has done a good deal of experimenting to save this waste, having tried rollers, grinders, etc., and as a result concludes that the old-fashioned light stamp is the best for the purpose. A new pumping engine, built from the designs of the company's mechanical engineer, has been erected at the stamp mill for supplying water from the lake. All the machinery in the mine, etc., will be duplicated, so that no danger of stoppage anywhere can arise.

The company has five locomotives for its railroad and uses three. Two are kept in reserve. The enlargement of the machine shop was done with the view the better to repair locomotives, railroad cars, etc. A third to a quarter of the force employed underground is engaged in putting in timbers.

The lode is generally from eight to ten feet in width, is very uniform, and is all taken down except as left for pillars at the shafts. The only rock wasted is the small percentage of trap that falls out from the hanging wall. The work underground is conducted with great regularity. The levels are uniformly the same distance apart, and are in all respects precisely similar. There are two man engines for the men to descend into the mine and come out from it, one for each end of the mine. The drilling is all with air drills, and the work of drilling, drifting, stoping, tramming, etc., is all done on contract. The company is very liberal in dealing with its men. No company on the lake pays as high wages as the Calumet and Hecla, for this reason they are at no loss for laborers, they command the best of skilled miners, and have an abundance of applications for places. On the other hand they are very strict with the men, requiring an intelligent and exact attention to their work, and will admit no neglect or deviation.

The number of miners—average—and timbermen, etc., employed underground, is 689 men. The total average force of men employed by the company, surface and underground, etc., is 1,650. The rock of course varies in richness. Some of it would give a very high percentage of copper, but they have a mile in length and it is nearly all good ground.

The levels are 90 feet apart on the lay and they are down to the 29th. There are nine working shafts numbered each way from the center, five in the Calumet and four in the Hecla. Steel skips are used, carrying about two tons load, varying with the size of the rock. The run is made at the rate of 400 feet per minute. The timber is taken down in the same shafts used in hoisting rock.

The four central shafts are now to the 29th level, 2,725 feet on the lay, the slip being 38 degrees northwesterly, average; they are all furnished with single skip tracks. The openings are kept several years ahead of present stoping, and no change is observed in the width or richness of the deposit. The Calumet mine is mainly in the southeast quarter of section 14, and the Hecla in the northeast quarter of section 23, T 56, R 33. No. 5 shaft of the Calumet mine, however, is considerably to the north, and is in section 13. No. 5 and No. 6 shafts of the Hecla are in section 23; they are at no great depth and are not used. No. 5 is to the 5th level, and No. 6 to the 2nd. Near the south line of this section, in the southwest quarter of the southwest quarter, section 23, is the south Hecla mine, Black Hills mine, as it is locally called; it joins the Osceola. One of the forties comprised in the fractional purchase, the northwest half of the southwest quarter of section 23, undoubtedly contains the main copper shoot of this Black Hills mine.

Dividend paid in 1882, $2,000,000; first dividend paid by company was in 1870, and total dividends to-day, $23,350,000; capital stock, $2,500,000; divided into 100,000 shares; market value per share $250; office of the company, No. 67 Milk street, Boston, Mass.; Chas. W. Seabury, Secretary and Treasurer, Alexander Agassiz, President, J. N. Wright, Agent, Calumet, Mich.

THE TAMARACK MINING COMPANY

Is one of the latest important copper companies organized in the State and one whose operations will be watched with the greatest degree of interest. The company owns a large territory, beneath which the continuation of the Calumet and Hecla mine must extend if sufficiently prolonged. A year ago they started to sink a vertical shaft at a point nearest to the Calumet and Hecla mine. The location of this shaft is in the southeast corner of the west half of the southwest quarter of section 14. This eighty is in the line of the Hecla mine shafts, and if the copper found in that mine continues it must be also found under this land. It is on this assumption, and with the view to reach it, that the downright shaft has been started. The depth of the lode at this point below the surface is estimated at about 2,000 feet. Five hundred and fifty feet of this distance have been sunk the first year, and in the mean time all the machinery necessary for completing the work has been permanently erected.

It is a novel enterprise, and the first of the kind undertaken in the region, but the hypothesis upon which it is based has every element of probability, and the outcome, if the work is persevered in, as it of course will be, is nearly certain to be successful.

This long shaft will have a further value, geologically, in exploring the different belts through which it must pass, and will afford the opportunity for making an interesting geological section of this, the most important portion of the range. North and northwest of this lot in section 14, and connected with it, the Tamarack company owns a large estate.

It is expected to cut the Allouez conglomerate within the next 50 feet, and hopes are entertained that this belt will prove productive to a much greater extent than it has heretofore been found to be. The basis of this expectation lies in the fact that the ground thus far gone through has afforded a good deal of copper. The amygdaloid belts that have been cut have been unusually rich;

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one in particular, at a depth of 450 feet, was found to be seven or eight feet wide, and from it considerable copper was obtained. It was perhaps good enough for an independent mine. Rich conglomerate copper boulders have from time to time been discovered on the surface in years past, that were not derived from the Calumet and Hecla lode, and they are believed to belong to the Allouez.

The shaft is 8x20 feet inside the timbers, perfectly straight and made double for double cage. The shaft house is 40x40 on the ground, and is 70 feet high. On the 12th of May last the shaft was down to a depth of 87 feet, and they are now, March 1, 550 feet deep. The largest number of feet sunk in one month was 67, and in one week 16½ feet, and the least number in a week was 7 feet. Two power drills are worked in the bottom, and they drill about 100 feet of holes in 11 hours. The average depth of each hole is 5 feet. They blast twice in 24 hours, and work six men at a shift, or at a time, in the bottom, and count on 2 feet of sinking during each shift, that is per day. This, of course, varies with the character of the rock. The amygdaloid drills easiest, but throws up the least rock. The trap drills harder but the blast excavates more. The water is raised with a pump to within 300 feet of the surface, thence up, in a bucket.

The engine for hoisting, etc., is double, and is a powerful one, each cylinder 24 inches by 6 feet, with shaft for drum 15 inches diameter. The cage works very noiselessly and with the least friction. All the arrangements are most excellent for economical and expeditious working.

The average number of men employed now is 30, and the company has built three boarding houses for the accommodation of the men.

It is probable that at the end of another year the shaft will be to a depth of 1,200 feet—that is Capt. Daniells' estimate. The capital stock is $1,000,000, divided into 40,000 shares.

Office of company in Boston, Mass., 178 Devonshire street; James D. Clark, President, A. S. Bigelow, Secretary and Treasurer; Agent, John Daniells, Calumet, Mich.

The estate comprises 1,280 acres.

THE OSCEOLA MINING COMPANY, CONSOLIDATED.

The Osceola is one of the best representative mines in the Lake Superior country. The lode gives but a low percentage of copper, it is irregular, and presents many perplexities. The mine is thoroughly equipped and vigorously worked. The management of its affairs is conducted with much ability and intelligence. In the commissioner's reports of 1880 and 1881 a history and description of the mine are given, together with a map showing the work underground up to each date. By comparison with the map contained in this report it will be seen that a large amount of work has been done in the mine during the past year.

No. 4, the southerly shaft, has been lengthened two levels, 175 feet. It is now 600 feet deep, and No. 3 has been extended four additional lifts in the past year, 300 feet, making the depth of the shaft now 825 feet. No. 2 has also been prolonged nearly four levels, 300 feet, so that it is now 975 feet from the surface, while No. 1 is down to the 11th level, 1,025 feet from the surface, having been increased in length in 1882, 225 feet, or three levels.

The extreme length of the mine in the line of the vein from north to south is 2,400 feet, and it holds this length from the surface down to the 6th level. As will be seen from the section of the mine here given, there is a great deal of opening and very much standing ground, a large portion of which is first class, that is, first class for the Osceola, since the lode is not a rich one. But there are more good copper stopes and and less barren ground to be seen now in the Osceola mine than ever before. In the openings made the last year there is apparently very little ground that will not pay to stope, and some of the stopes are extraordinarily good. The 6th, 7th, 8th, 9th, and 10th levels, extended south from No. 3 shaft, all show well in copper, which, added to the fact that the bottom of No. 2 shaft is also good, becomes an encouraging feature in the mine.

A block of ground 600 feet long, north of No. 1 shaft, and above the first level, has been stoped away in the past year, and the 2d level was extended in the same direction a distance of 150 feet. But from the 2d level down to the 5th no work was done north of No. 1 shaft. Below the 5th, however, to the 9th a good deal of stoping has been done, especially between the 5th and 6th and 6th and 7th, commencing 200 feet north of the shaft and reaching to 500 feet. Between No. 1 and No. 2 shafts no work has been done above the 7th level, but in this latter some stoping is now in progress, also between the 7th and 8th, and between the 8th and 9th, all of which are good stopes. Recently, in the bottom of the 3d level some miners were set at work with excellent results. The stope is showing well in copper

Between No. 2 and No. 3 shafts a block of ground was beaten away in the 2d level just north of No. 3 shaft, and also some stoping was done between the 4th and 5th, the 5th and 6th, and the 7th and 8th levels. The greater portion of this ground below the 6th level between these shafts so far as proved is excellent. No. 2, 3, and 4 shafts will be sunk to the 12th level, after which the mine may possibly not be pushed so rapidly in depth. If the openings continue as good as they now are it will not be necessary. Less stoping ground will be required and less extent of vein will have to be opened to secure the product. While it is not a rich mine it is a very good one and apparently improving. It is remarkably well handled and the statistics of the work show extraordinary results:

The number of tons of rock stamped was, 1882	172,529	
Which yielded of mineral, pounds,	4,547,300	
Moss and barrel rock, pounds	263,941	
Total of mineral copper, pounds	4,811,241	
Which yielded when smelted, pounds ingot	4,176,788	
Costing per pound, cents		11.019
Number of pounds of mineral per ton of rock mined was		27.88
Number of pounds of ingot per ton of rock mined was		24.21
Percentage of mineral in each ton of rock stamped		1.394
“ “ “ “ “ “ “ “ handled		1.164
Number of fathoms of ground broken	11,425	
Number of tons of rock mined	205,158	
Which is divided as follows to wit.:		
Number of fathoms of rock taken from stopes	8,984	
“ “ “ “ “ “ “ shafts	380	
“ “ “ “ “ “ “ winzes	208	
“ “ “ “ “ “ “ drifts	1,010	
“ “ “ “ “ from the Conglomerate mine	823	
Total number of fathoms of ground broken	11,425	

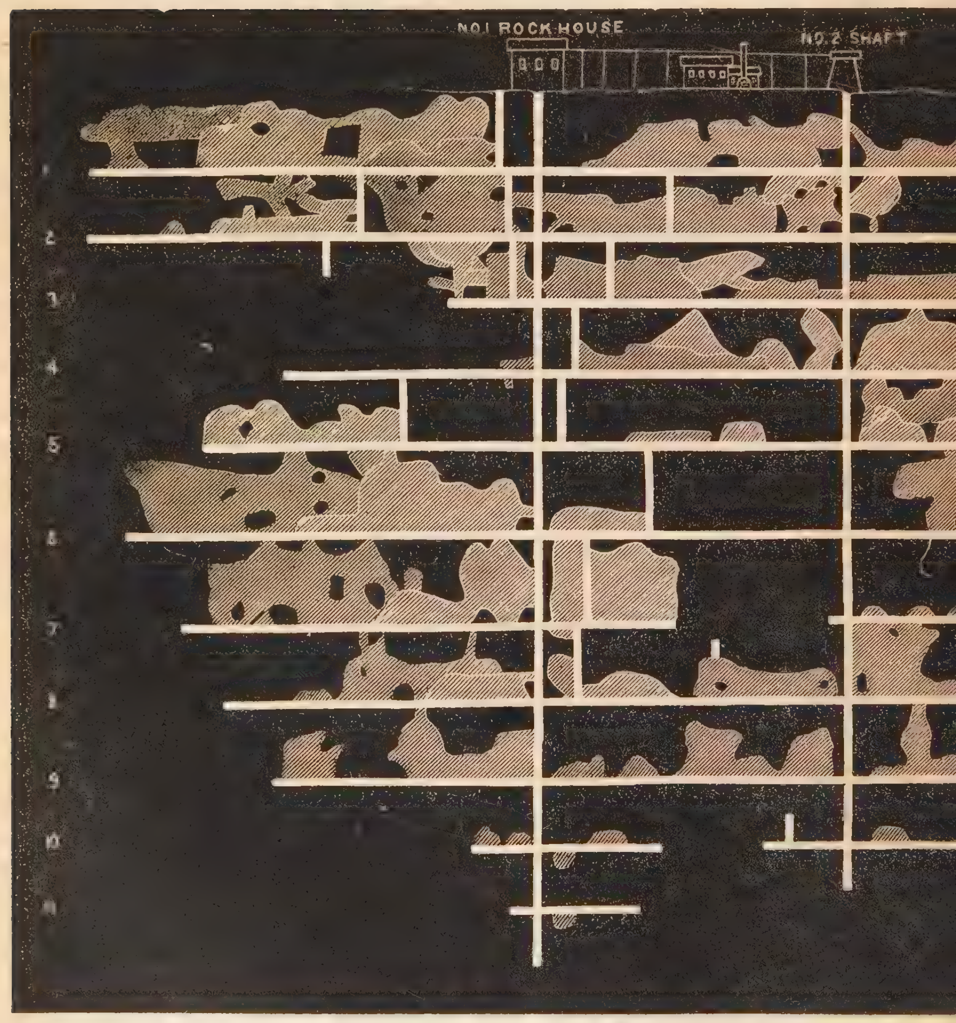
The total stamp mill expense per ton of rock was, cents		42.47
The number of tons stamped per cord of wood used was	16,003	
The railroad charges per ton of rock carried were, cents		30
Other charges connected with railroad carrying		1.19
Total transportation cost per ton of rock, cents		31.19
Percentage of labor in stamp mill cost		43.59
" " supplies " " "		56.41
Total amount of rock hoisted, tons	205,658	
Total number of tons of rock discarded	33,129	
" " " " " " stamped	172,529	
Total cost per ton of rock hoisted		$2.2378
" " " " " " stamped		2.6676
Percentage of cost in every department of mining:		
Conglomerate		.04021
" rock-house		.00628
Amydaloid		.58850
" rock-house		.04573
Mining		.62871
Assorting and breaking		.05201
Transportation		.11695
Stamping		.15923
Incidental		.01745
Surface		.01149
Office		.01416

GENERAL EXPENSES FOR 1882.

Conglomerate	$20,839 00
" rock-house	2,888 81
Amygdaloid	272,680 52
" rock-house	21,045 33
Transportation	53,823 42
Stamping	73,286 05
Incidental	8,031 59
Surface	5,290 32
Office	6,519 41
Total running expense, including $4,163.54 of exploratory ac't	$464,404 45
Construction account for 1882	36,436 78
Total expenditures for 1883	$500,841 23

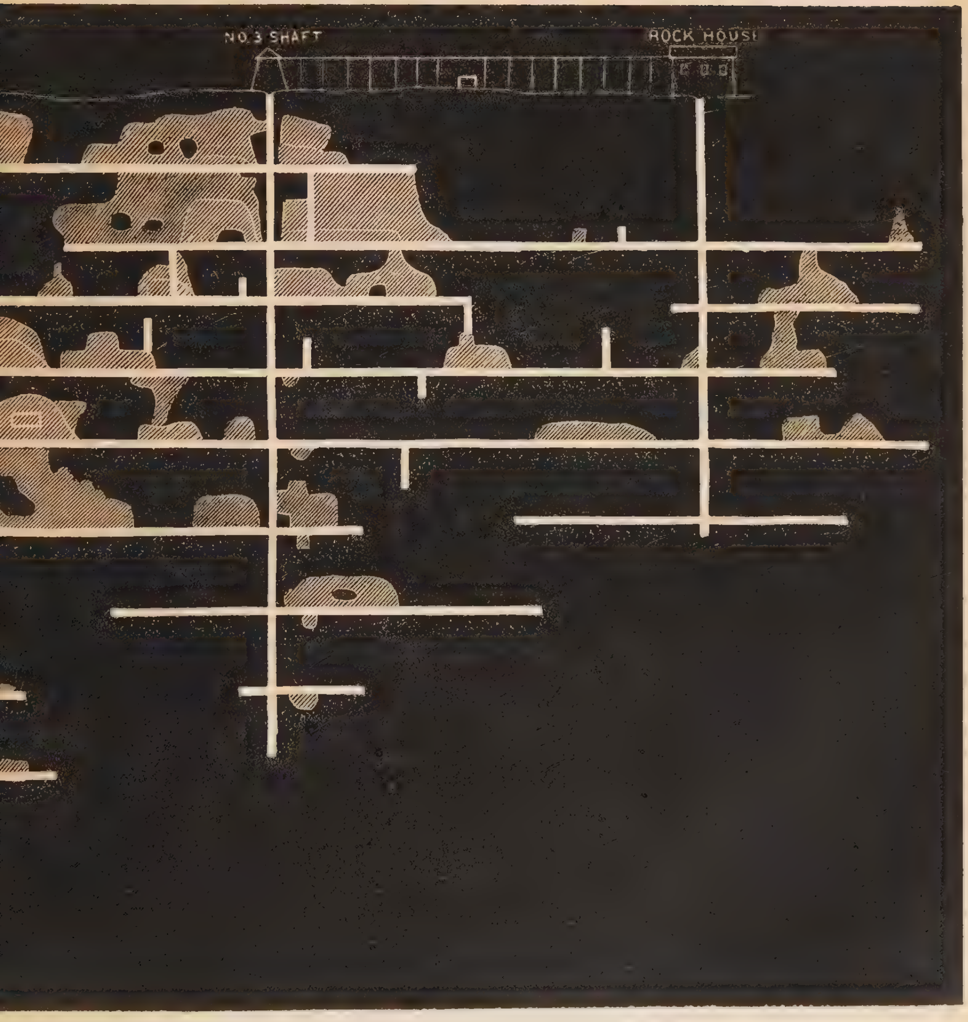
LONGITUDINAL SECTION OF THE OSCEOL

Scale,



(ON THE AMYGDALOID VEIN), JAN., 1883.

e inch.



AMYGDALOID MINING EXPENSES AND WORK.

	Days.	Feet of shaft.	Price per foot.	Feet of winze.	Price per foot.	Feet of drifts.	Price per foot.	Fath's of stopes.	Price per fathom.	Am't paid for shaft.
Total	482,842	976.20	......	1,250.10	......	6,059.40	......	8,984	......	15,109.60
Average	4,024	......	$15.47	......	$12.26	......	$8.31	......	$10.10	......
Men	155	......	......	......	......	......	......	......	......	......

	Amount paid for winzes.	Amount paid for drifts.	Amount paid for stopes.	Am't paid for exportation.	Total.	Change house expense.	Net earnings by contract.
Total	$15,333.60	$50,407.72	$90,804.61	$3,528.06	174,183.59	$83,144.16	$85,039.43
Average	......	......	......	......	......	......	......
Men	......	......	......	......	......	......	......

Average wages, $45.79.

Percentage of labor to total mine expenses	48.83
" " supplies to total mine expenses	51.17
Total cost on contract price, mine expenses	$174,183 59
" " of tramming	20,118 48
" " " timbering	15,810 53
" " " captains	4,068 89
" " " company accounts, labor	21,459 80
" " " carpenters, blacksmithing, machine work, etc.	3,946 87
" " " drill sharpening	211 85
" " " hoisting and pumping	16,917 44
" " " compressor work	17,235 64
" " " supplies	8,374 93
Total	$282,328 02
Credits	9,647 50
Leaving total Amygdaloid mining cost	$272,680 52
Total rock-house expenses were	$21,045 33
Number of tons of rock crushed in rock-house	190,537
Cost per ton of rock, rock-house expense, cents	11.04
Average wages paid rock-house employés per month	39.80

There have been two mines, the old one in the Calumet and Hecla conglomerate, and the present mine in the amygdaloid, which underlies the former 800 feet to the southeast. The conglomerate is worked out and filled with water up to the first level or near it; but recently some exploring that has been done and is still in progress in this mine is promising of good results.

They started a drift to the west from No. 2 shaft in the first level, and are now in on this drift 190 feet from the main mine. At 50 feet in they cut an amygdaloid belt that carries considerable copper, and they are also drifting each way, north and south, in this belt. Have gone a total distance of 185 feet. This drift to the west will be continued.

The rock at the stamp mill is now yielding 1½% ingot, ¼ of one per cent above the average of last year, and the mine looks as if the average of the present year would be fully 1½%. To make the same product would probably require 15,000 or 20,000 tons less of rock to be sent to the mill as compared to last year, which would represent a saving in railroad transportation alone of about $5,000, to say nothing of mining cost, stamp mill cost, etc, though as to the latter the rich rock does not stamp up as readily as the poor rock. They have had poor ground to the south, but in the bottom of No. 3 shaft, and now to the south, it is greatly improved, an important fact as has been once before remarked, since, if continued, it will give a greater length to the productive portion of the mine. The rock is showing a larger percentage of copper, and is softer and of a much more favorable appearance. The openings made in the mine in 1882 exceed the length of those made in 1881 by more than 1,000 feet. The machinery from the conglomerate has been placed in the new hoisting building for working Nos. 1 and 2 shafts of the Amygdaloid mine. It cost last year $1.20 per 100 tons to keep the tracks connecting the rock-houses with the main line of railroad free from snow. The cars carry 13 tons each, reckoned at 12½ tons each. The mill now turns out on an average 9 tons of copper per day. February, 1883.

Dividend paid in 1882	$200,000
Total dividends to date	885,000

Capital stock $1,000,000, divided into 40,000 shares, par value $25 each, present market value $30.

Business office of company 178 Devonshire street, Boston; James D. Clark, President; A. S. Bigelow, Secretary and Treasurer; John Daniells, Agent, Opechee, Mich.

Product of the Osceola mine for each year to 1883 is as follows, refined copper:

Years.	Net Tons.	Lbs.
1874	468	-----
1875	665	303
1876	846	1,737
1877	1,382	777
1878	1,352	1,998
1879	1,598	1,387
1880	1,691	1,537
1881	2,089	1,876
1882	2,088	782
Total product	12,184	497

THE PENINSULA COPPER MINING COMPANY

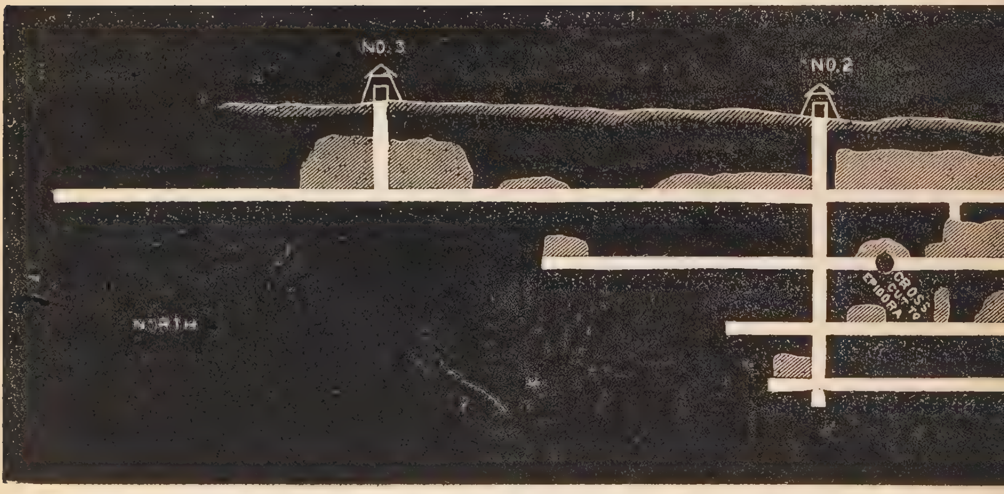
Is the successor of the old Albany & Boston, and was organized but a few months ago, with business office in Chicago. Chas. Fargo, President, F. A. Brown, Secretary and Treasurer, C. M. Wheeler, General Manager, Marquette, Capt. Wm. A. Dunn, Superintendent. The estate comprises section 7 except west ½ of southwest ¼; all of section 8; section 9, except northwest ¼; section 10, except east ½ northeast ¼, and south ½ section 11, all in township 55 N., R. 33 west, in all, 2,560 acres of land, which the company owns in fee simple.

It will be remembered that Mr. Wheeler and others secured an option for the purchase of the entire property for $110,000. These gentlemen sold to Mr. Fargo and others a half interest in the property for the sum of $350,000. The capital stock of the new company is $1,000,000, divided into 40,000 shares.

The mine is in a belt of conglomerate, overlaid by sandstone. A longitudinal section of it is here shown. The conglomerate is made up of boulders and broken fragments of a great variety of rock, with copper pretty well distributed through it, in some portions having a large percentage. There not infrequently occur boulders of nearly pure copper, such as are found in the Calumet

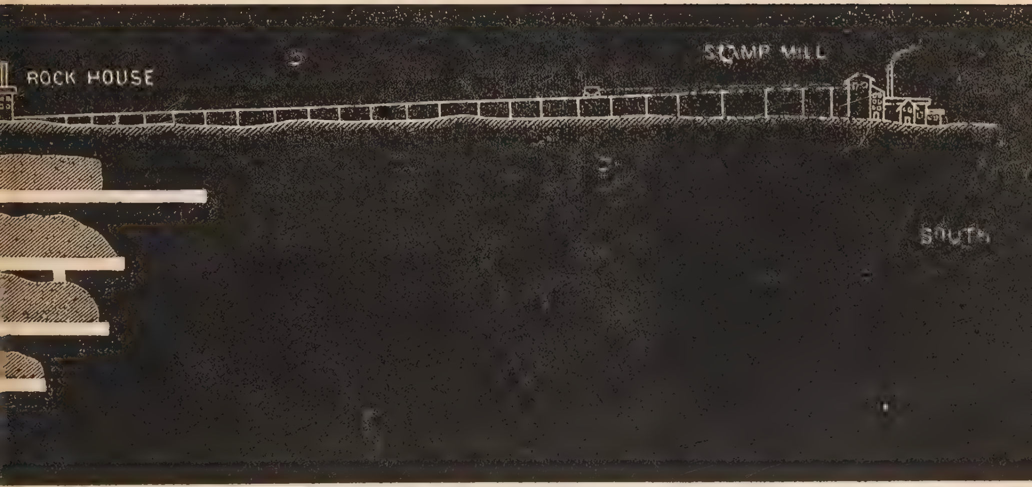
LONGITUDINAL SECTION OF

Scale,



PENINSULA MINE, JAN., 1883.

one inch.



lode. The mine is looking well at all points, and the favorable showing which the stamp mill is now making cannot but be continued.

The present company is operating only on shaft No. 1, formerly the Bigelow shaft, and has been working in the second, third, and fourth levels, south of No. 1, but north of No. 2. The conglomerate is the southeast belt, crossing the property. The others are the Epidote or Mesnard, Pewabic, Calumet, etc. Opening was made here in the Epidote many years ago, and in the first level it proved so rich that the fact created considerable stir at the other mines in the vicinity. However, in the second level, so far as it was proved, it showed poor, and was abandoned. The Pewabic lode is supposed to cross the section line near the ¼ post in the west line of section 8.

They are now working in all the levels south of the shaft, and in the fourth to the north also, where they have a good stope. The shaft No. 1 is sinking to the fifth level, and is down 60 feet below the fourth. It is looking well in the bottom. The lode is 15 feet wide, and there are rich places of considerable magnitude frequently occuring indiscriminately in various portions of it. If there is any difference in this respect it is poorest along the hanging wall, but there are no long stretches of barren ground. Apparently not more than 10 or 15 per cent of the rock will have to be rejected. The mine looks better than it did a year ago; there is more to be seen that gives assurance that it will make a paying mine. I should think that the estimate of 1½% ingot for the rock that will be stamped is not an exaggerated one. The lode is one that can be advantageously worked, being so steep that the rock will readily roll down to the levels against the stulls.

For some unaccountable reason the old company timbered all the openings. There certainly is no necessity for so doing, as the walls are firm and will be sufficiently supported by pillars, and so much timbering as was done occasioned a greatly increased expense with no apparent advantage.

The new stamp mill was started the sixteenth of January, 1883, with one Ball head, a very large one, 10-inch shaft, and 16-inch cylinder. The mill is located at a distance south from the rock-house of 1,386 feet. An elevated track connects them, starting from the ground floor of the latter and coming into the top of the stamp building, 46 feet from the ground. The car running on this track is drawn up with a rope winding in a drum worked by a small engine placed at the upper end of the track. The stamp building is 42 feet square, and the wash-house connected with it extends south 74 feet.

In working the stamp head the superintendent finds that 85 pounds of steam raises it to just the right hight, 90 pounds is too much, and 70 not enough; the weight of the shoe is 860 pounds. The valve opens 3-32 to raise the head and 1½ inches to force it down. This tremendous power of the steam added to the weight shows the force of the blow 8,050 pounds. The shoes have had to be changed every fourth day. So far the castings for the head and rock breaker amount to 10 cents per ton of rock.

The wash-house is furnished with 24 collum washers—iron frames—and three Evans slime tables, each 20 feet diameter. All the mill work has been done under the supervision of Mr. Wm. Riley, who also made the plans, etc. All the machinery in the mill works admirably, and is doing excellent work. It is found that another head will be required, and one has been contracted for. The present mill will be duplicated, the enlargement will be on the west side of it. It is thought that there is water sufficient for two heads, by running it back into the pond. If not the plan is to make another pond at some distance below the present one, and pump the water into the upper pond.

The car comes under the shute in the rock-house at the end of the track that runs to the mill. The bin at the top of the mill will hold 800 tons. If there is water enough, and the management are very confident that there is, the arrangements are certainly very convenient for economical working. A side track from the Mineral Range Railroad comes to the stamp mill. A new compressor has just been procured, made at the Cuyahoga works, Cleveland, Ohio, of a new pattern, and is very inexpensive, comparatively.

They have also contracted for the machinery for opening in the Pewabic lode, to which they have sunk near the sump of the old stamp mill at a point near the section line. They find it looking favorably, they say. Two shafts will be sunk. The company employ now 180 men, 60 of whom are miners and trammers.

The Peninsula mine has produced as follows:

Years.	Tons.	Lbs.	Years.	Tons.	Lbs.
1862	3	1,982	1873	33	200
1864	3	1,000	1876	3	18
1865	150	160	1877	5	1,998
1866	81	1,906	1878	---	1,746
1867	31	493			
1868	117	536	Total product	440	36

Capt. Dunn, who for some years has been agent for the sale of the Hercules powder, gives the following items regarding it: No. 1ss sells at 33 cents per pound. It is 50 per cent nitro-glycerine with wood pulp absorbent. No. 2 white has magnesia for absorbent, and is also 50 per cent nitro-glycerine, and sells at 36 cents per pound. The advantages of the latter are that the magnesia burns up the gases, and when warmed it does not separate. It is safe, as shown by many occurrences. Through the carelessness of miners 20 pounds of it went down in a skip at the Calumet and Hecla, and the rock was dumped into it, after which it was hoisted and all dumped in together in the rock-house and no accident resulted. At another time 250 pounds of it in a box with an amount of caps were burned in the same mine. Everyone fled and a catastrophe was apprehended, but only the caps exploded. The fire spread to the wood work in the mine, stulls, etc., and did some damage. The wood pulp he says is not as safe and the difference in price is only three cents per pound. A cartridge holds one-half pounds, usually fired with a large cap on end of fuse. A cheaper grade of black powder is sold. It contains a proportion of nitro-glycerine and wood pulp absorbent.

Between the Peninsula and the Franklin are a number of mines that were formerly worked to some extent, but which have been for many years idle.

These are the Mesnard, Pontiac, Highland, Concord, etc.

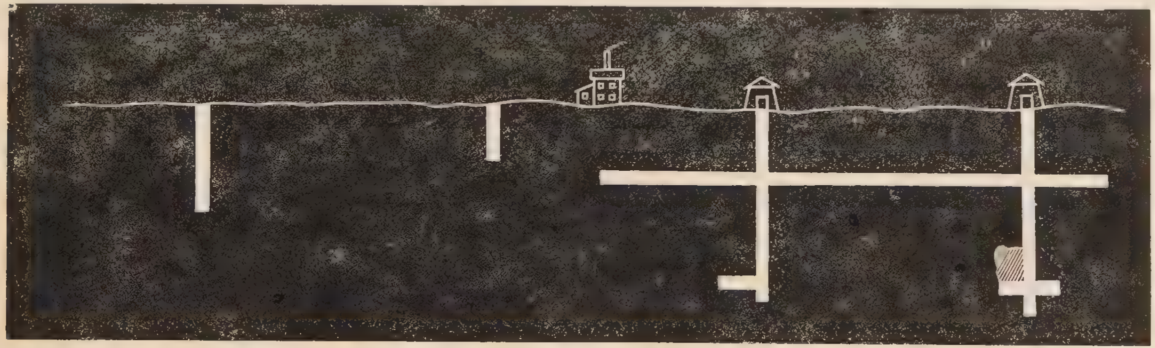
The former consists of 160 acres, N. E. ¼, Sec. 24, T. 55, R. 33. The company was organized in 1862 and worked a few years in a hard, trappy, epidote vein, with poor success. The total amount of copper taken out was 42 tons and 97 pounds. The present secretary and treasurer of the company is D. L. Demmon, No. 19 Congress street, Boston, Mass. The Franklin company uses its winzes, etc.

THE PONTIAC MINE

Joins the Mesnard, being the S. E. ¼ of Sec. 13. It was worked at about the same period as the latter, with no important result.

MESNARD COPPER MINE, JAN., 1883.

Scale, 150 ft. to one inch.



THE DOUGLASS MINING COMPANY

Was organized at about the same time as the above, and did some mining work in the Isle Royal lode, resulting in getting out 84 tons 1,502 pounds of copper. The description of the property is N. E. ¼ Sec. 30, and N. W. ¼ Sec. 29, T. 55, R. 33.

THE HIGHLAND

Joins the Douglass as does also the Concord, where considerable work has been done. It was operated by the Franklin and Pewabic companies, and has shipped 333 tons 8 pounds of copper.

THE DORCHESTER.

This mine did a little work on the Mesnard epidote. There are a number of others of these idle locations which have little present value.

THE FRANKLIN MINING COMPANY.

The Franklin mine has been steadily improving since the company resumed control of it and began to again work it on company account. Capt. Vivian has expressed great confidence in the mine and the result has borne out his predictions and shows "that his faith was well founded." It started again in 1875 in very bad shape, having been during the preceding five years worked on tribute and become exhausted. That is, there was little ground opened for stoping, the buildings and mining plant were the worse for wear, and there was little money in the treasury with which to meet the emergency. However the effort was made to rescue the mine from the utter ruin which impended, and the effort has been successful. Without resorting to any assessments the mine has been brought to a first class paying position, $220,000 have been expended in equipment since July, 1874, and there is also nearly $250,000 surplus, all of which, together with the working expenses, have been furnished by the mine, making nearly a net earning of $450,000, and bringing the mine into an excellent condition.

The mine has six shafts. No. 1 is nearest to the Pewabic, and thence they are numbered in their order to the northeast. No. 1 is 600 feet deep, but it is no longer used as the ground below it is stoped away to the Pewabic line. No. 2, the next shaft north, is 1,740 feet deep, down to the 23d level, and is 450 feet from the Pewabic line. No. 3 is 900 feet from the line, and is 1,620 feet deep. In its descent it inclines towards No. 2. Considerable ground yet stands between these shafts from the 5th to 13th level. No. 4 shaft is 1,380 feet from the Pewabic line, and is down to the 20th level, or to a depth of 1,440 feet. No. 6 is 1,890 feet from the Pewabic line, and has only been sunk to a little below the 3d level, 210 feet from the surface. Some of the levels have been driven north beyond No. 6. An inspection of the map will show that the Franklin, like the Pewabic and the Quincy, does not afford much ground that they are obliged to leave. North of No. 3 the opened ground has been taken pretty closely. The surface length of the vein in the Franklin is one-half mile across the S. W. ¼ of Sec. 24, T. 55, R. 34. The mine begins on the section line, the boundary between it and the Pewabic. As the company owns the W. ½ of Sec. 24 it will have an increased length of vein for some time, until the west line is reached, when the south end of the mine will shorten, giving it to the Pewabic, but the north end will continue to lengthen. The working shafts are Nos. 2, 3, and 5. The mine has no man engine. They work now 23 air drills, Rand Nos. 2 and 3. The compressor is a National Duplex, 18x42 inches, and there are also two small Burleigh compressors that were formerly used and may now be if required.

No. 2 shaft is now working to the 23d level, No. 3 to the 22d level, and No. 5 to the 23d level. Each shaft has been sunk since 1874 10 levels. The lode is pretty regular, widths in places varying from 10 to 30 feet, and also varying in the quality of the rock. It possesses the usual characteristics of a good copper-bearing amygdaloid. The walls are firm, the hanging being sufficiently well supported with the pillars, requiring but little timbering. So far as possible the poor portions of the vein are left standing. Of the rock hoisted about twenty per cent is rejected. This waste rock comes in the copper-bearing portions of the vein, and is made up from the dykes of trap that have been taken down. A few men—4 to 6—do hand drilling in odd places where it will not pay to set up an air drill. In the use of high explosives great care is exercised. Men are forbidden to tamp a hole that has explosives in it. Any violation of the rules in this regard is followed with expulsion. The following notice is furnished to the men by the company and is, as Capt. Vivian claims, strictly enforced:

NOTICE TO MINERS.

You are hereby requested to take notice of the following important facts:

1. That black powder and high explosives of any kind are not safe to use together in the same hole.
2. The cap is the only exploder that is safe to use in firing off high explosives, which does away entirely with tamping.
3. The only tamping necessary on high explosives is a small piece of miner's clay, which is easily put down on the charge with a wooden bar.
4. The practice of picking and boring out missed holes that have been charged with either black powder or high explosives is strictly prohibited.
5. Any miner on the mine known to use black powder and high explosives together, thereby necessitating tamping, will be discharged from the employ of this company.

FRANKLIN MINING COMPANY,
By JOHNSON VIVIAN,
Superintendent.

FRANKLIN MINE, *December 6, 1880.*

The average total force employed was, men,	432½
" " " miners " "	148
" " " underground men other than miners	128
Making the total underground force	276
Average stamp mill force, men,	57

Four men and two boys with air drill sunk 50 feet per month.

No. of tons of rock hoisted	148,042
" " " mined	148,795
" " " stamped	118,370
" pounds of mineral produced was	3,976,340
" " ingot copper produced, being 82.22% was	3,264,120
Per cent of mineral to rock stamped	1.68
No. of pounds of mineral in a ton of rock stamped	33.59
Mining cost per ton of rock, including everything	$2 35
Stamp mill expense, included in above, per ton of rock	55.50

Total No. of feet drifted	2,537.6
“ “ “ sunk in the mine shafts	462
“ “ “ “ “ “ winzes	301.3
“ “ fathoms stoped, cubic fathoms	7,036.347
“ “ yield of mineral per fathom of rock hoisted, pounds	483
“ “ “ ingot “ “ “ “ “	398
“ “ pounds of mineral in a ton of rock hoisted	26.86
“ “ “ ingot “ “ “ “	22.02
Cost per foot of drifting, all air drill work,	$10 34
“ “ “ sinking shaft, “ “	16 41

This cost includes all items connected with the work.

Cost of stoping per fathom, including cost of breaking	$12 14

Tramming is done on contract by the skip. They used 23 air drills eight months, and for four months have used 24.

Some trouble in this and in the Pewabic mine is experienced for want of water. The mine does not furnish enough for steam purposes in winter, and they are now melting snow to help out.

Since writing the foregoing I have received from the secretary of the company the annual report to the stockholders, which I also include, as it contains much of interest regarding this mine.

ANNUAL REPORT OF THE FRANKLIN MINE.

Herewith you will find a full report from our agent of the condition of the mine, December 31, last, and also for his doings for the year 1882; also a statement of the receipts and expenditures for the year, as well as the financial condition at its close; the latter showing a surplus of $244,330.37, which is a handsome gain from January 1, 1882, at which time the company showed, including the rock broken in the mine, a surplus of $116,842.65. This year, although the amount of rock broken has increased 753 tons, it has been thought best to place no value on it, although its actual worth is, at least, equal to last year, *i. e.*, $30,000, which amount would make a handsome addition to our surplus.

Since January 1 the loan account, $20,000, has been paid from sales of copper, and the company is now, for the first time since given up by tributers, entirely free from debt for borrowed money, owing only its regular business drafts for labor, supplies, etc., etc.

It has been urged by some of the stockholders that, with so large a surplus on hand, a dividend should be paid, and the directors have had the matter under frequent discussion, but so far have refrained from paying one, as it will readily be seen that to do so would necessitate the borrowing of the entire amount paid, as the surplus consists mostly of copper and supplies, the amount of cash on hand being only about sufficient, with receipts from present sales, to meet the regular running expenses of the mine. This fact, with the unsettled condition of the tariff question, and business generally, decided the directors in withholding, for the present at least, their final decision on the subject, and it may be well to make no final decision until the annual meeting, at which time the question can be fully discussed and decided upon by the stockholders, for the tariff question will, undoubtedly, be fully settled ere that time.

Although no cash dividends have been paid since the company resumed control of its property, the stockholders who have waited patiently are certainly no losers, for at the time operations were commenced (eight years ago) the stock was selling at from $3.00 to $3.50 per share, on a basis of 20,000 shares. Allowing even one per cent per month interest, or one hundred per cent for the time elapsed, and the receipt of one hundred per cent in stock dividend, which, at a low valuation to-day, is worth $12.50, the stock would show a profit of $900 on an investment of $350, besides interest at twelve per cent per annum on amount invested, which investment surely is not a bad one, considering that no money has ever been called from the stockholders, and the mine was considered played out at the time work was commenced.

Our agent, Captain Johnson Vivian, has managed the business at the mine with exceptional skill, economy, and good judgment, and the directors take pleasure in testifying to that effect.

During the year 148,042 tons of rock were hoisted, and treated, at a cost of $2.35 per ton.

The number of pounds of mineral per ton was	26.86
" " " ingot " " "	22.02
The average yield of ingot from mineral was	82.22

The amount of ingot produced was 3,264,120 pounds, or a gain over 1881 of 585,323 pounds ingot.

The yield per ton of rock was 1 68-100 per cent mineral, being a gain over 1881 of 26-100 per cent in richness of ore.

Respectfully submitted,
L. L. DEMMON, *Treasurer.*

OFFICE OF THE FRANKLIN MINING COMPANY,
HANCOCK, HOUGHTON COUNTY, MICH., *Jan. 10, 1883.*

DEAR SIR,—With pleasure I submit the following report of our doings, with inventory and annual cost sheet, showing in detail the cost of each department of our business for the year ending December 31, 1882.

SURFACE WORK.

The improvements made in this department are as follows: A shaft-house over No. 2 shaft, the old one being too badly decayed for further use, a small blacksmith's shop for sharpening miners' tools, and a stone powder-house. The trestle-work between Nos. 2 and 3 shafts and the heavy frame work at the head of the incline have been rebuilt, both of which are now in good condition and will last for many years. We have continued the work of overhauling old tenement houses and other buildings, that was commenced two years ago, which has placed the greater part of our buildings in far better condition than for the last fifteen years. On the 17th of April last a fire broke out in the roof of the hoisting engine house which, with the upper floor of the building, was destroyed. The loss was a little over $3,000, all of which was covered by insurance. But for our fire engine and hose, which were handsomely handled by our engineers, and saved the machinery, etc., the loss would have been at least $20,000 and a delay of at least six weeks, which would have taken at least 250 tons of copper out of the product for last year. By saving the machinery we lost only five days' hoisting.

MACHINERY.

We have added to this department two small engines, which are used in the mine at Nos. 2 and 3 shafts for pumping water from the deep levels where the main pump cannot reach it. These engines are operated by compressed air at intervals when this power is not used for other work. Nothing of a serious nature has happened to any of our machinery during the past year, and all at this writing is in good running order.

STAMP MILL.

Some little repairs to both stamping and washing machinery are necessary, which we shall do during the coming month. We intend to put on large cylinders to the stamps which we expect will save at least ten per cent in the cost of treating the rock. It will be necessary during the ensuing year to make arrangements for taking care of the sand from the mill. We cannot run a very large amount of it into the lake after about the first of May, and to continue that long a new dock will be required to take the place of the one now in use, which we shall doubtless be compelled to fill in with sand at an early day. By putting up a wheel to elevate the sand 25 feet there will be ample room for all the sand that the mill produces for at least 25 years.

MINING WORK.

No. 2 shaft has been sunk from the 22d to the 23d level. The lode for the entire distance is large and well filled with barrel and stamp copper. The 23d level has been opened north of the shaft 75 feet, and south 67 feet, all of which will pay well to stope. The 22d level has been opened south 170 feet, and north of the shaft 187 feet. All of this back except the last 75 feet of the former exposed good paying ground. Some of the lode north of the shaft was very rich in all grades of mineral. There is a good block of ground still standing. The 21st level has been extended south of the shaft 125 feet. The lode in this opening is not so large as is usually found in this part of the mine, but it contains a fair amount of stamp copper. This level has been extended north and connected with No. 3 shaft, which has laid open a large block of ground that will pay to remove by stopes. We have not extended any of our openings to the boundary with Pewabic since we left the 19th level, but we intend to push the 23d level along to connect with Pewabic as soon as possible, in order to prove up a large block of ground that is before us.

No. 3 shaft has been sunk from the 20th to a point 68 feet below the 21st level. The lode on the whole in this opening is rather lean. There is a large portion of it that will not pay to stope. The 21st level has been opened north of the shaft 130 feet. The lode for the entire distance only produced stamp rock of a low grade. The 20th level has been extended south and connected with the drift from No. 2 shaft. The first hundred feet exposed some fair stamp rock, but the last 175 feet is poor. This level has been extended north of the shaft 240 feet, the greater portion of which will pay to take out.

No. 5 shaft has been sunk from the 18th to the 20th level. The lode for the whole distance is large and contains copper in all grades in paying quantities. The bottom level at this shaft has been opened 120 feet, all of which is a fair lode for stamp mineral. The 19th level has been opened south 250 feet, and connected with No. 3 shaft. A large portion of this back of ground will doubtless pay to take out, but there is also considerable of it that is not very valuable. This level has been opened north of the shaft 165 feet. At this point the lode is of more than the average richness of the mine. The 18th level has been opened north of the shaft 175 feet. Most of this block of ground has been removed, which has given us, during the past year, a large amount of good stamp and barrel copper, with a few small masses. We intend to push this level north as fast as possible for at least one year so as to prove up that large piece of territory laying between our openings and the Mesnard mine boundary line.

FUTURE PROSPECTS.

Everything considered our prospects are equally as good for 1883 as they were January 1, 1882, and unless something happens to our machinery or the ground fails to produce what we have good reason to expect from it, the product for the ensuing year will doubtless be about as much as we got in 1882. The time has arrived when it becomes necessary for us to turn our attention to coal for fuel. Wood for that purpose is getting too far off to be used for fuel with economy after the coming summer. A dock at the lake and a railroad from the bottom of the incline-road to the dock should be constructed during the coming summer, so that coal could be cheaply handled for at least what is necessary for the engines on the mine, and I am satisfied that it can be used at the mill with economy.

For further information in relation to our business I beg leave to refer you to the annual cost sheet and the map of the mine, which has been very carefully marked up to this date by Mr. H. Southworth, M. E.

Capt. Thomas Dennis and Mr. Arno Jaehnig, the clerk, are still with us, and I take pleasure in saying that they have faithfully performed their respective duties.

I am yours respectfully,

J. VIVIAN, *Superintendent.*

STATEMENT OF ASSETS AND LIABILITIES OF THE FRANKLIN MINING COMPANY, JANUARY 1, 1883.

Assets.

Copper on hand, 1,315,858 lbs., 18c., ($40,000 lbs. of which has been sold for early deliveries)		$236,854 44
Cash on hand		21,912 66
		$258,767 10

Contra. Liabilities.

Loans, " bills payable,"	$20,000 00	
Drafts outstanding	27,474 30	
Due for smelting	7,659 57	
" " freight	2,771 73	
		57,905 60
Surplus assets, at Boston		$200,861 50
Supplies at mine	$79,880 55	
Less liabilities at mine	36,411 68	
		43,468 87
Entire resources over liabilities		$244,330 37

The rock broken in the mine, but not hoisted, January 1st, 1882, was estimated at 15,247 tons, valued at $30,000.

The rock broken, but not hoisted, January 1, 1883, was 16,000 tons, and estimated in assets, nothing.

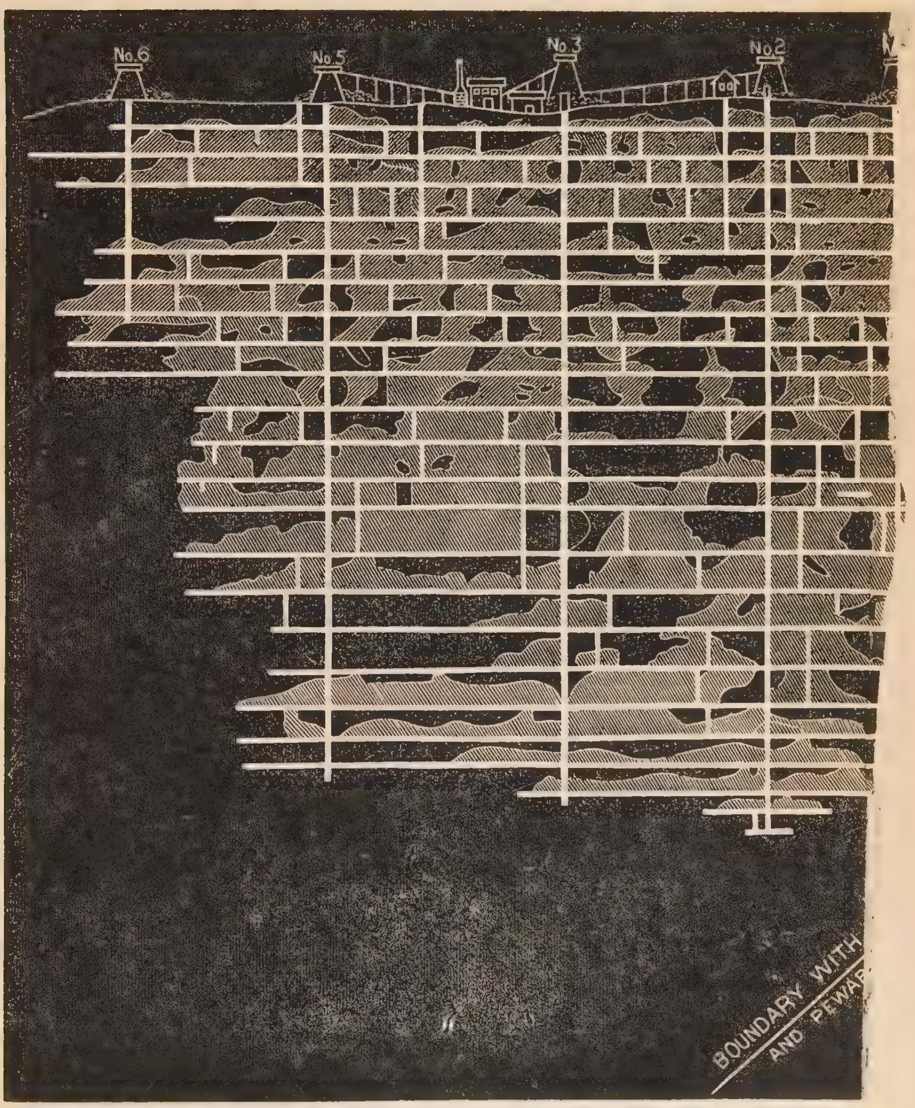
E. & O. E,

CASH RECEIPTS AND EXPENDITURES OF THE FRANKLIN MINING COMPANY, FOR YEAR 1882.

Cash on hand January 1, 1882	$25,588 58
" from sale of copper, in 1882, 2,778,714 lbs., at 18 174-1000	505,007 61
" " loans	219,135 37
" " sale of silver	880 04
" " " supplies at mine	736 32
" " interest account	523 19
" " rebate on freight	659 35
	$752,530 46

LONGITUDINAL SECTION OF THE FRANKLIN

Scale, 420 ft. to one



Contra.

Cash paid loans	$295,855 54
" " drafts	364,924 93
" " smelting	38,241 10
" " freight and storage	14,310 02
" " brokerage	2,619 99
" " interest	5,554 44
" " expense, insurance, taxes, etc., etc.	8,418 52
" " mine account, Nashua Iron & Steel Co. (old claim)	694 16
" on hand January 1, 1883	21,912 66
	$752,530 46

Product of the Franklin mine for each year:

Years.	Tons.	Lbs.
1857	3	699
1858	56	1,104
1859	116	1,211
1860	157	1,860
1861	783	43
1862	733	645
1863	639	684
1864	605	1,335
1865	779	1,481
1866	819	994
1867	701	455
1868	737	1,326
1869	779	970
1870	589	-----
1871	300	1,000
1872	186	-----
1873	183	-----
1874	283	1,790
1875	583	800
1876	963	641
1877	1,169	1,817
1878	1,299	1,528
1879	1,414	1,703
1880	1,168	466
1881	1,338	1,932
1882	1,632	120
Total product	18,023	604

Office of the company, 19 Congress street, Boston. D. L. Demmon, Secretary and Treasurer.

THE PEWABIC MINING COMPANY.

The Pewabic is a short mine and a deep one. The surface length of the vein on the property is 1,450 feet, being across the corner of the N. W. ¼ of Sec. 25, T. 55, R. 34. As the dip of the lode is north, the mine has been shortening with each successive level, at both ends, the Franklin on the north, and the Quincy on the south, between which it lies. The company also owns a small piece off from the S. W. ¼ of Sec. 24, commencing at the point in the section line where the vein crosses it and running at right angles to the vein to the west line of Sec. 24, so that the line of the vein and the boundary lines form a right-angled triangle. The amount of the lode possessed by the company previous to the late purchase of the Edwards tract was embraced in the surface length of the vein, 1,450 feet, a downward length along the Franklin lode of 1,900 feet, and the hypothenuse along the Quincy and the Edwards land of 2,400 feet. This area was, however, nearly worked out and the company were forced to purchase the S. E. ¼ of Sec. 23, into which the openings since 1879 have been pushed.

The depth of the mine—No. 6 shaft—is 2,220 feet on the lay of the vein. Its extension into the Edwards land is 540 feet. The length of the vein in the present bottom within the lines of the property is 1,200 feet. The gain in length is 120 feet for each successive level. The bottom of the mine is the 30th level. Down to the 25th the levels have been extended to the east boundary, but below that point they shorten until the bottom level only reaches 50 feet each side of the shaft. Unfortunately the bottom does not prove productive, and stoping has consequently been done in the upper levels. The man engine has been completed down to the 160th level, or to a depth of 1,300 feet. Between No. 4 shaft and the boundary line north, down to the 240th fathom level, there is but very little ground left standing in the mine. From the 120th up, between these limits, it is all gone except a few pillars that cannot perhaps be got at. From No. 4 to the Quincy boundary the greater portion of the ground yet remains—left because it will not pay, as is supposed, to remove. Since the new ground into which No. 6 shaft has been pushed has proved so poor, there is a disposition to attack that which has been left in the upper part of the mine. Of this there is a large stretch between No. 4 of the Pewabic and No. 1 of the Quincy, 1,000 feet in length, that has not proved to be productive, especially down to the 20th level. Many of the levels in both mines have been extended into it, but very little stoping has been done.

In November, 1879, the company purchased the ¼ section of land adjoining the property, for the sum of $275,000, and levied an assessment of $200,000 to partially cover the same, taking the balance from the treasury and thus leaving it empty. The mine had no openings, having been worked out down to the line of the new purchase. The new ground was of course unopened, and the vein began about 1,600 feet from the surface. A great deal had been said about the new ground and much was anticipated. It was deemed that the Pewabic had entered upon a new career that should be more successful than any portion of her past. The work of opening was necessarily slow as there was only one shaft. At the beginning of 1882 the 25th level was reached, from which point the mine became remarkably poor and has since continued to remain so; although the openings have been pushed forward as vigorously as possible, no good ground has been reached. Altogether it may be said that this new Pewabic, as it is called, has proved greatly disappointing.

There seems to be no other way than to continue to push ahead. The experience of the Quincy indicates that such a course will result well in the long run. With that mine where poor ground was struck they could fall back on the stopes left for such an emergency, and so keep up the product until the openings came into better ground again. Capt. Vivian has pushed things with energy and skill, and though disappointed he still thinks the only way is to continue doing as they have done and they will no doubt come out all right in the end. Continued opening is the only method of solution. A diamond drill was used to a limited extent as in the Quincy, to discover if there are any of the lateral pockets in the mine which have been found to be so important an adjunct in the Quincy. No such branch veins are found either in the Pewabic or in the Franklin. It is a rich amygdaloid belt, rich in places with well defined walls. All the hoisting from the mine is in No. 6 shaft; it is a long run.

The shaft should be enlarged, furnished with double track, and larger skips used, those that will hoist 4 or 5 tons instead of 1½ to 2 tons. They use small engines in the mine worked with compressed air, use also three small engines in pumping up water. The vein dips northwesterly 54°. With this mine and also the Franklin the railroads from rock-house to head of incline are each operated with small locomotives.

No. of tons mined	72,848
" " hoisted	74,042
" " stamped	59,242

No. of pounds of mineral produced	1,788,785
“ “ refined copper produced	1,482,664
Per cent of mineral in rock	82.88
Total cost for mining, treating, etc., etc., one ton of rock	$3 03
“ “ “ stamping, etc., also included in above	64 97
$3.03x72,848, equals entire mining cost.	
Total No. of feet drifted	1,980.9
“ “ “ “ cross-cut	120.1
No. of cubic fathoms stoped	2,814.106
“ feet of shaft sunk	243
“ winzes sunk	410.2
Cash paid per foot for drifting, average	$14 02
“ “ “ “ sinking shaft	18 22
All air drill work and profits on supplies are not deducted.	
Stoping with air drill per cubic fathom	14 44
“ “ hand drill per cubic fathom	18 27
The hand drill work was about 1-8 of the whole stoping.	
Yield of mineral per fathom of rock hoisted, 434 lbs., of ingot, 360 lbs.	
Average No. of miners, 1882, on contract,	88
Includes also the boys who work on the drills.	
Average total force	261
“ No. of men employed on company's account	82.50
Use 13 air drills, Rand No. 2, Allison's compressor.	
Assessment, 1882, $2.00 per share, 40,000 shares,	$80,000
The elevation above the lake is 600 feet.	
Fuel—wood—costs per cord	$3 25

I have received from Mr. D. L. Demmon copies of the reports of several mines of which he is treasurer, which will be added to what I have written.

ANNUAL REPORT OF PEWABIC MINE.

Herewith you will find a very full report from our agent of the doings at the mine the past year, and a cut of the underground workings, showing its exact condition January 1, 1883. Where it reads on map, trial stope, the rock is worthless, or nearly so.

Our agent also gives a detailed statement of the extraordinary expenses at the mine and mill, which were incurred under the idea that the mine would maintain its reputation as of old, but which, to our great disappointment, it has not yet done; still the money is not by any means thrown away, as the openings had to be made in any case to reach the copper supposed to be in the barren levels opened. Failing to find paying rock in the localities which have proved barren, the only remedy was to push ahead as fast as possible to find where the copper is, for it is the general belief that the “Old Pewabic” must at sometime regain its prestige of being the richest amygdaloid mine on the lake.

Our agent has done, and is doing, all that any man can do to find this deposit, and it is not from any fault of his that it has not been found long ago, and there is no good for the stockholders being discouraged, for the well-known Quincy mine, adjoining us on the south, has at times been as poor as the Pewabic now is, and was only saved from passing dividends or assessing, from the fact that the management has always very wisely kept a large surplus of cash on hand to be used in such emergencies.

The mine is now fairly well equipped, the machinery in good order and condition for working our present shaft, and if we are fortunate enough to strike one of the old time bonanzas, matters will change for the better very quickly; in fact, our agent seems to think the change has already commenced, as will be seen by the following letter, under date of February 17th, 1883, as follows:

February 17th, 1883.

The lode in the shaft is still poor. The lode in the 30th level, south, is showing some rich stamp rock and some good pieces of barrel copper. If it continues, as it is now showing, any reasonable distance, it will pay well to stope. It is more like one of Pewabic bunches than anything we have had since we left the 25th level. I will send you, per next express, a box of rock taken from it. This level, north, is poor. The lode in the 29th level, south, is showing a little copper, but not of much value, and the same may be said of this level, north. The lode in the 28th level, north, which is about into the winze sinking from the 27th level, is showing ground that will be stoped. The lode in the winze is showing stoping ground. The stopes in the back of the 180 fathom level are still showing full as well as usual. On the whole, the mine is showing better than for the past year. Product for February will be a little more than what we had for January. * * Annexed will be found the usual statements of the treasurer, giving receipts and expenditures for the year, also assets and liabilities, December 31, 1882.

Respectfully submitted,

D. L. DEMMON, *Treasurer.*

CASH RECEIPTS AND EXPENDITURES OF THE PEWABIC MINING COMPANY, FOR THE YEAR ENDING DECEMBER 31, 1882.

Cash on hand January 1, 1882	$26,557 97
“ received from sale of 1,328,496 lbs. copper, at 18 350-1000c.	243,777 05
“ “ “ loans	349,441 53
“ “ “ assessments	57,528 00
“ “ “ sale silver	753 97
“ “ “ interest	785 63
“ “ “ rebate on freight	83 99
	$678,928 14

Contra.

Cash paid loans	$358,916 53
“ “ mine agent's drafts	254,802 66
“ “ interest	9,193 53
“ “ interest and storage	1,044 49
“ “ smelting and freight	28,324 19
“ “ expense, brokerage, copper charges, taxes, etc., etc.	10,399 78
“ on hand January 1, 1883,	16,246 96
	$678,928 14

STATEMENT OF ASSETS AND LIABILITIES OF THE PEWABIC MINING COMPANY, JANUARY 1, 1883.

Assets.

Copper on hand, 572,509 lbs., 18c.	$103,051 62	
Cash on hand	16,246 96	
Due from assessment (uncollected)	22,472 00	
		$141,770 58

Contra. Liabilities.

Loans	$89,500 00	
Drafts outstanding	19,474 26	
Forfeited stock (due for)	1,185 60	
Smelting, November and December	2,957 54	
Freight	970 70	
		$114,088 10
Balance of assets, Boston		$27,682 48
Supplies at mine	$58,699 26	
Less liabilities at mine	25,857 74	
		$32,841 52
Total balance of assets over liabilities		$60,524 00

D. L. DEMMON, *Treasurer.*

E. & O. E.
BOSTON, *February, 1883.*

STATEMENT OF PRODUCTION, AND COST OF SAME AT MINE.

Number of tons of rock hoisted in 1882	74,042
" " " stamped	63,592
Cost per ton, entire treatment	$3 03
Pounds of mineral, per ton hoisted	24.16
" ingot, per ton hoisted	20.02
Percentage of ingot in mineral	82.88
Total amount of ingot produced, pounds,	1,482,664
Tons of rock stamped, per cord of wood,	10.84
Cost of stamping, per ton of rock,	0 64.97

In 1881, 60,427 tons were stamped, giving a yield of 1,872,878 lbs., or 1 92-100 per cent.

In 1882, 63,592 tons were stamped, giving a yield of 1,482,664 lbs,, or 1 51-100 yield, showing a decrease of 41-100 per cent in yield, and an increase in amount stamped of 3,165 tons.

It is estimated that there are about 5,000 tons of rock in the mine broken, and ready for hoisting, against 6,194 tons, December 31, 1881.

OFFICE OF THE PEWABIC MINING COMPANY,
HANCOCK, HOUGHTON COUNTY. MICHIGAN, *January 10, 1883.*

DEAR SIR,—In accordance with our usual custom, I have the honor to present the following report of our operations at this mine, with inventory, etc., for the year ending December 31, 1882:

SURFACE WORK.

The improvements made in this department are as follows: A large rock-bin, with trestle-work connecting it with No. 6 shaft house, and a large snow-shed attached to the same, assistant mining captain's office, and a thorough overhauling of tenement-houses, barns, etc.; new trestle-work and snow-sheds, at the incline-road, which were in bad condition and not safe to run on.

MACHINERY.

The old boilers, referred to in my last annual report, at the hoisting engine, have been taken out and rebuilt, and furnished with new iron fronts, smoke box, etc., and since August last have been working very satisfactorily. We have made considerable change and improvement in the hoisting engine, by sliding the pinion wheel on the side which detaches the engine from the hoisting drum and putting two band-breaks on said drum, by which the skip is lowered while the engine is standing still. With this arrangement we have greatly increased our hoisting capacity, and saved the engine from more than half of its usual wear and tear.

The man-engine has been rebuilt and is in successful operation to the 16th level. We intend during the ensuing year to extend it to the 21st level. The air compressor, pumping engine, and all other machinery about our works are in good running order.

STAMP MILL.

The old boiler-house, which was about ready to fall, has been taken down and replaced with a new one, which is in every way a great improvement over the old. We have added to the machinery of the mill a duplex steam pump, which has a capacity of two thousand gallons of water per minute, which is a decided improvement over the old centrifugal pumps that have been in use here for many years. Two heads of stamps and all the rest of the machinery in the mill are in good condition. The other head requires some repairs to put it in good order.

MINING WORK.

No. 6 shaft has been sunk from the 27th to the 30th level. With but little exception the lode exposed in this opening is poor. Just below the 29th level a mass of copper, about three tons, was taken out, and the general appearance of the lode at this point is some better than it is at any point between this and the 27th level, but I doubt if there is any ground in the vicinity of the shaft from the 27th to the 30th level that will pay to stope.

The 30th level has been opened north of the shaft 45 feet, and south of same 40 feet, at which point it is connected with a winze from the 29th level. The lode north of the shaft seems to be of a much better character than anything we have had below the 25th level. A mass of copper, about 18 tons, was found just north of the shaft, and there is still a small mass of copper standing in the back of the drift. We shall start a stope at this point in a few days, to prove its value. The lode in the south drift at this level, and that which the winze passes through, contain a little copper, but I doubt if there is enough to pay for stoping.

The 29th level has been opened south 120 feet, and north of the shaft 114 feet. The lode south from time to time has shown a fair amount of stamp copper, with a few pieces of barrel work, but on the whole it is rather lean. The lode north of the shaft is very poor for the first seventy feet, but the last 40 feet has exposed some copper that may pay to take out.

The 28th level has been opened south 222 feet, all of which is poor. This level has been opened north of the shaft 165 feet, which is also very poor, but the last few feet opened seemed to show a little better looking lode, with some pieces of stamp rock in it, but nothing that will pay to take out.

The 27th level has been opened south 247 feet. The lode for the entire distance is very hard, small, and poor. This level has been extended north of the shaft 217 feet, which has exposed considerable ground that paid for stoping, most of which has been taken out. In the bottom of this level, near the boundary with Franklin, there is a fair show of stamp copper. We shall sink a winze at this point to prove its value.

The 26th level has been extended south 240 feet, and north to the line with Franklin. The south ground is all poor. The ground north of the shaft paid for stoping, or at least the greatest part of it. The 25th level has been extended south to the line with Quincy 220 feet. The last 40 feet paid to remove with stopes. The balance of this opening is too poor to work. The 24th level has been extended south 90 feet, at which point it intersected the Quincy line. All of this, except about 25 feet, exposed a fair lode for stamp copper.

Two winzes have been sunk in this part of the mine, one from the 23d to the 24th level, and the other from the 24th to the 25th level, near the line with Quincy. In both of these openings the lode is showing some good stamp copper, which we are now taking out. From the 19th to a point about 25 feet above the 18th level, near the line with Quincy, we have had a good block of ground which has paid very well, and there seems to be considerable of it left.

The length of the productive ground north of the line is about 90 feet, which we are now working with two drills. We have opened into the west lode, which is from 15 to 25 feet from the main lode, with cross-cuts at the 240th, 250th, 260th, and 270th levels, and on the line of this lode at the several levels about 90 feet. In some places some very good stamp rock was found, and a few pieces of barrel copper, but on the whole that lode, so far as we have examined it, is too poor to work. To prove up the foot-wall of the main lode we have pierced it with the diamond drill at the 240th, 250th, 260th, and 270th fathom levels without finding anything of value.

FUTURE PROSPECTS.

At this writing it is impossible to predict with the least degree of certainty what can be done for the ensuing year in the way of product, for as you are aware, our productive ground that will pay to stope is getting very short, and unless we find in some of the lower levels remunerative ground, I cannot see how the present product can be kept up. You cannot fail to notice in the map of the mine that there is a large amount of ground opened. If it was all as productive as what we had above the 25th level it would be sufficient to supply our present hoisting facilities for over two years without opening another foot in any direction. When the company purchased the new territory it was the opinion of everybody that knew anything about such matters that it was a prize, and nothing short of large dividends would be in order at an early day, and had the lode continued to be as productive as it was when we started on the new ground in November, 1879, long ere this their expectations would have been realized. Being fully persuaded that the lode in the new territory would be at least as productive as it has been in the old ground for many years past, we started to put the mine, mill machinery, and surface in the best possible condition for economical working. To do this it has cost a large amount of money, but had the mine continued to yield as in former years all these improvements, repairs, etc., would have been paid for out of the profits made, and the last assessment never heard of.

For the information of such stockholders who have not visited the mine and are not well acquainted with such operations, I annex a statement giving as much as possible in detail what has been done to place the mine in good working order, together with the cost attending the same.

Captain Josiah Hall severed his connection with the company on the first of July last, to take the agency of the Centennial mine, and Captain Thomas Whittle was employed to take his place. Capt. Whittle is a thorough practical miner, and has attended to the duties of his position to my entire satisfaction.

For further information in relation to our business, I beg leave to refer you to the map of the mine, which I send herewith, which has been carefully measured up by Mr. L. G. Emmerson, M. E., and the tabular statements of the clerk, Mr. J. H. Vivian, giving as much as possible in detail the cost of each department of our works.

I am yours respectfully,

J. VIVIAN,
Superintendent.

EXTRAORDINARY EXPENSES.

Buildings.

Additions to No. 6 shaft house	$1,049 40	
Engine house, No. 6 shaft, with foundations, etc.	750 00	
Mining captain's office	350 00	
Oil house	300 00	
Three dwelling houses for assistant, mining captain, and engineer	2,825 92	
Clerk's office and warehouse	597 75	
Two kitchens to dwelling house	128 49	
Repairs to dwelling houses and barns	3,411 74	
Carpenter shop, lumber yard, and iron room	1,200 00	
Rock-bin, snow-shed, and trestle-work	1,704 80	
Snow-shed over incline road	68 70	
Locomotive-house	580 86	
Drum-house and machinery at incline	1,424 64	
Trestle-work at incline	561 47	
Blacksmith shop	225 00	
Compressor house with foundation, for machinery, etc.	1,750 00	
Wood-dock, at lake	115 00	
Repairs to man-engine house	400 00	
“ and changes to boiler house	150 00	
“ “ “ miners' change-house	200 00	
Water cistern, foundation, pipes, etc.	400 00	
		$18,193 77

Tools and Machinery.

Seventeen Rand drills	$6,723 00	
Duplex air-compressor	5,738 72	
Air-pipe, for same, labor, etc.	4,575 00	
Two Blake rock-breakers, shafting, etc.,	2,525 00	
Cameron feed-pump	265 00	
Two new boilers, fronts, pipe, etc.	3,350 00	
One heater and pipe	300 00	
Repairing and replacing 2 old boilers	2,510 94	
Hose-reel, and 400 feet 1½ inch hose	325 00	
Injectors and lubricators	218 00	
Repairs and alterations to hoisting-engine	1,600 00	
Three Parry engines for hoisting rock in mine	1,000 00	
One new skip	375 00	
Man engine	14,163 85	
New tools in machine shop	1,951 30	
Jack-screws, blocks, wrenches, etc.	300 00	
		45,920 81

Stamp Mill.

One steam pump	$2,036 45	
“ “ “ for feeding boilers	355 00	
Two iron sills for foundation of heads	702 40	
Two guides, caps, etc., for stamp shaft	456 23	
New tools for machine shop	2,000 00	
Eleven washing machines	810 00	
Labor and supplies in repairing mill	4,871 60	
New boiler house	974 62	
		12,206 30
		$76,320 88

Mine Work.

Repairing No. 6 shaft, and other parts of the old mine	$4,750 00	
Exploring with diamond drill	2,839 94	
Sinking 375 foot of shaft in unproductive ground, at $18.22 per foot	6,832 50	
Sinking 375 feet of winzes in unproductive ground, at $15.80 per foot	5,925 00	
Drifting 1,800 feet, ditto	25,236 00	
Cross-cuts to west lode, 126½ feet, at $13.50	1,707 50	
Drifting on west lode, 55 feet, at $12.00	660 00	
		$47,950 94

Surface Work.

Repairing railroad to mill	$1,613 40	
Building dam for feed water	600 00	
Making woodyard	400 00	
Fencing and making roads	500 00	
Stumpage paid, wood still standing which will be cut next year	3,240 00	
		6,353 40
		$130,625 22

Product of the Pewabic mine:

Years.	Tons.	Lbs.	Years.	Tons.	Lbs.
1855	2	301	1870	273	-----
1856	53	1,567	1871	222	600
1857	118	254	1872	233	1,000
1858	208	603	1873	286	400
1859	514	1,949	1874	147	607
1860	958	1,426	1875	312	1,271
1861	924	1,992	1876	284	935
1862	785	1,281	1877	346	1,777
1863	845	1,562	1878	261	1,826
1864	714	1,857	1879	168	519
1865	865	1,394	1880	485	509
1866	673	140	1881	938	244
1867	823	458	1882	741	666
1868	521	1,523			
1869	480	409	Total	13,198	1,230

Office of the Pewabic Mining Company, 19 Congress street, Boston. D. L. Demmon, Treasurer; Johnson Vivian, Superintendent, Hancock, Michigan.

QUINCY MINING COMPANY.

The Quincy mine ranks second among the copper mines of this State. The percentage of copper in the rock is greater in the Quincy than in any other mine except the Calumet and Hecla; but unlike the latter the characteristics of the Quincy lode are similar to those of the other mines. It has its poor portions and its rich ones, its narrow places and its wide ones. It is extremely "pockety," making it difficult to determine the walls, but withal it affords annually a large product, and has acquired the confidence of the mining public to a degree not excelled by that of any other mine. In a mining sense the Quincy is a synonym of reliability.

The mine is in the same lode with the Pewabic and the Franklin, but it differs materially from either of them in some important features that redound greatly to the advantage of the Quincy. The chief of these peculiarities are the so-called east and west branches which are found in the Quincy mine, and from which so great a portion of the product comes. They have been mainly found with the diamond drill and do not seem to occur in the mines west of the Quincy. The ground plan of the levels from the 80th down, show the main branch flanked by these laterals. Of these the east branch—the line of pockets found from the foot-wall—is by far the best. These lateral pockets, those which are the best, are from 60 to 100 feet from the main branch, and sometimes they prove very rich. The westerly pockets, or west branch, do not produce so well. The amygdaloid is harder, more "trappy," too much so to pay to work. Some of the pockets which make up the east branch are 200 to 300 feet in length, and all good stoping vein matter. The mine begins from the Pewabic line in the west line of Sec. 25, at about midway between the quarter-post and the west section corner, and extends thence southwesterly about 4,000 feet; that is, the length of the vein on the property is about that distance. The company owns all of Sec. 26 except the S. W. ¼, which belongs to the Hancock, and the mine as above stated, is at the northeast end of the vein on the company's property.

The depth of No. 2 shaft is 2,150 feet, and of No. 4 2,090 feet. These are the two working shafts of the mine and represent its extreme depth. The greatest underground length is in the 180 fathom level, which is 3,400 feet. Between the 180 and 190 is the intersection of the old and the new Pewabic lines. The man engine is down to the 240 fathom level.

The results of the year have been about the same as for 1881. The dividend was the same, but the per cent of copper to rock stamped was somewhat in excess of the previous year, 3.21 per cent, exclusive of the mass or barrel work. The yield of ingot per fathom of ground broken was 800 pounds, greater than ever before. In 1881 it was 767 pounds. The per cent of the rock rejected was 7½ per cent of total amount hoisted, which also represents a gain. Formerly it was 10 per cent; 7½ per cent is the lowest showing ever made for any year. It is of course due to the greater uniformity of the ground.

The total number of tons of rock hoisted was	109,751
" " " " " " " stamped was	101,327
Total mining cost per ton of rock hoisted	$4 05
" " " " " " " stamped—all cost except smelting	4 39
The product in mineral was stamp work, pounds	6,508,410
" " " " " barrel work, "	365,820
Total number of pounds of mineral produced	6,874,230
Total number of pounds of refined copper produced	5,682,663

Which divided by the number of pounds that were stamped gives the per cent of ingot to rock 2.8.

The stamp mill expense, including cost of barrels, etc., was 71.6 cents per ton of rock stamped.

The mining work is done on contract, drifting and sinking by the foot, and stoping by the fathom, tramming and hoisting on company account. Average cost per foot for drifting, exclusive of profit in supplies, size of drift 5x6 feet, $8.88.

Average cost per foot for sinking shafts	$15 18
" " " " " " winzes	12 00
" " " fathom for stoping	12 87

These prices include profits on supplies. The miners get in cash about one-half of the above, the balance is paid in supplies, with which they are charged up.

The average number of men employed for the year, 26 days to the month	438
The average number of miners on contract was	105
" " " " " " company account was	47
" " wages " " " contract was	$48 83
" " " " " " company account was per day	1.50 to 1 75
Board costs, average price per month	16 00
All living expenses amount per month to	20 00
Number of drills operated, Rand No. 3	18

Among the improvements are a new stone boiler-house at the mine, supplied with eight new boilers made at Riverside Iron Works, Detroit. These now furnish all the steam used at the mine. The construction of a new engine-house has been begun. Compressor-house is a separate building. The water for the boilers is now pumped up from the lake; use a Worthington pump and 10-inch pipe. The elevation is 575 feet. Formerly the mine water was used, and as the mine has increased in depth requiring a greater amount of strain, a want of water was seriously felt, particularly in winter. To meet the deficiency the melting of snow was resorted to, as is now done at the Pewabic and the Franklin mines. The company paid of the year's profits $11 per share, dividends.

The business office is No. 4 Exchange street, New York. Thomas F. Mason, President; Wm. R. Todd, Secretary and Treasurer; Frank White, Agent, Hancock, Mich.; John Cliff, Mining Captain.

The Quincy mine has produced as follows:

Years.	Tons.	Lbs.	Years.	Tons.	Lbs.
1856	6	1,462	1870	1,248	1,777
1857	61	762	1871	1,204	1,501
1858	153	772	1872	1,134	1,134
1859	178	1,114	1873	1,400	-----
1860	970	414	1874	1,525	654
1861	1,282	852	1875	1,334	281
1862	1,153	218	1876	1,536	1,171
1863	1,115	1,737	1877	1,427	336
1864	1,251	586	1878	1,480	449
1865	923	1,500	1879	1,323	1,458
1866	1,172	1,000	1880	1,848	263
1867	1,013	1,000	1881	2,753	884
1868	727	1,000	1882	2,832	1,796
1869	1,208	1,365			
			Total	32,333	1,445

The longitudinal section of the mine herewith given is marked up to end of the year.

ANNUAL REPORT OF THE QUINCY MINING COMPANY.

The directors submit the following report of the business of the mine for the past year, and statement of the financial condition of the company:

The shipment of the season was 6,853,660 pounds of mineral, which has been smelted and yielded about 82.67 per cent, or 5,665,796 pounds of refined copper. The product of the mine for the year as prepared for shipment was 6,874,230 pounds or 3,437 230-2000 tons of mineral, of the following descriptions, namely:

Stamp copper, pounds	6,508,410
Mass “ “	365,820
	6,874,230
For which, estimating copper on hand in New York at 18 cents per pound, and the product left over at the mine at 82 per cent yield and 15 cents per pound, has been realized the gross sum of	$970,363 27
Realized from sale of silver	3,142 83
	$973,506 10

The expenses of the year are as follows:

Running expenses at mine		$381,010 82
Building and construction account		63,427 63
Smelting, transportation and all other expenses		96,969 13
		$541,407 58
Which, deducted from gross earnings		973,506 10
Leaves as mining profit		$432,098 52
There has been realized during the year from interest and profit on sale of company's stock		16,455 33
		$448,533 85
The statement of assets and liabilities in our last report showed a balance on hand, as of date January 1, 1882		735,313 79
Add earnings of 1882		448,553 85
		$1,183,867 64
Deduct dividend of February 20, 1882	$320,000	
Deduct dividend of August 21, 1882	200,000	
		520,000 00
Leaving balance of assets January 1, 1883		$663,867 64

A dividend of $6 per share or $240,000, payable February 15, has been declared, which, with dividend of $5 per share paid August 21 last, makes total for the year $440,000.

The usual financial statements are presented herewith, and also the report of Mr. F. G. White, agent at the mine, in which will be found a clear and succinct account of the mine work, and of improvements made during the year and in progress. All of which is respectfully submitted,

THOMAS F. MASON,
President.

NEW YORK, *February 10, 1883.*

GENERAL SUMMARY OF RECEIPTS AND EXPENDITURES OF THE QUINCY MINING COMPANY FROM ITS ORGANIZATION TO DECEMBER 31, 1882.

Expenditures.

For expenditure on location previous to 1856	$42,037 98
“ “ “ Quincy vein, 1858, not now worked	55,000 00
“ openings or explorations on 3,800 feet “east” or Pewabic vein, extending to Portage lake, preparatory to future work	11,500 00
“ real estate and permanent improvements on same, including dwelling-houses, stamp mill, machinery, steam engines, tram road, dock, warehouse, and other buildings and roads	851,543 83
“ mining and surface labor, expenses of smelting and marketing copper, and all incidental expenses	10,151,274 05
Balance carried down	3,993,867 64
	$15,105,283 50

Receipts.

From capital stock paid in	$200,000 00
" proceeds copper and silver (65,242,704 lbs. copper)	14,683,191 71
" interest	95,447 95
" profit on sale P. L. & R. Improvement company stock and other investments	97,637 16
" real estate "Hancock"	47,006 68
	$15,105,283 50
By balance brought down, being receipts over expenditures	$3,993,867 64
Deducting dividends declared, 1 to 28 inclusive	3,330,000 00
Leaves balance as per statement	$663,867 64

SUMMARY FOR THE YEAR.

Average force employed, men	438
" number of miners	152
" wages of miners on contract, per month	$48 83
Yield of mineral per fathom of ground broken, pounds	970
" refined copper per fathom of ground broken, pounds	800
Total rock mined, tons	120,377
" " hoisted, "	109,751
" stamp rock treated, tons	101,327
Yield of stamp rock treated (3 21-100 per cent) pounds	6,508,410
Product mineral, pounds	6,874,230
" refined copper, pounds	5,682,663

AGENT'S REPORT.

QUINCY MINE,
LAKE SUPERIOR, MICH.,
January 20, 1883.

The progress made with our mine work and development the past year has been satisfactory, other than the annoyance, during the early months, of a lack of steam, which was later entirely obviated in the use of the new plant of boilers.

No 2 shaft has been sunk from the 28th to the 30th level. No. 4 shaft has not yet reached the 30th level, but will do so early in the year, when our opening work will be directed for the present to extending the levels both north and south. Above the 24th level we have done but little drifting, while in and below that level we have accomplished about the same amount of drifting as for the year previous, leaving our mine reserves comparatively equal to the conditions of previous years; yet, with improved hoisting facilities we expect to increase the reserves during the current year. The usual accompanying plans will show the stoping to have been well distributed, and though we have not met the phenomenal occurrence of copper opened in the 25th and 26th levels, we have met a number of more than average rich stopes, notably in the 22d, 27th, 28th, and 29th levels, distributed from south of No. 4 shaft to north of No. 2 shaft. The stope above the 22d level, now connected with the 19th level north of No. 2 shaft, gives promise of extending back or east and above that level.

The 24th and 27th levels, south of No. 4 shaft, have not realized our expectations, as we have not yet opened the continuation of the very productive ground found in the upper levels, but we are now driving at these points, expecting to meet success at a more southern point. The 18th level has been driven south 240 feet during the year, in the main through broken ground, resembling that met in the upper levels south of the so-called fissure vein or crossing; and though we have little of promise south of crossing, the copper bearing vein seems to lengthen in depth with the dip of the crossing to the south, and warrants the expectation of productive stopes in the part of the mine yet to be opened by the extension of the levels below this point.

In accordance with instructions we have replaced our boilers at the mine by the purchase and erection of eight new tubular boilers, with pump and connections; also erecting a stone building for same, and now have them in use, supplying steam to the hoisting engines, compressor, pump engine, and machine shop, and have found their duty in every way satisfactory, furnishing all steam required at present, while they are equal to largely increased demands for steam in the future. We have also erected a new stone engine-house back or east of No. 2 shaft, to which No. 2 engine will be removed, to connect with new hoisting gear and drum, which is now on foundation, all of which will be completed during the early spring months. Should the necessity arise for increased hoisting facilities, we will be able by the addition of another drum, the foundations and frame for which are already provided, and the placing of a double skip road in No. 2 shaft, to largely increase the duty at that point.

At No. 4 engine no change has been made, except the removal of the engine used for pumping and running the man engine, which has been removed, repaired, and placed upon its new stone foundation in the same building with the compressor, and is doing good duty. The timber foundation under No. 4 hoisting engine is becoming decayed, and we will be soon forced to replace it with stone. When done, we would advise the erection of a new stone building east of shaft, a change in drum and gear, which will then remove all our machinery from wooden buildings at the mine, largely reducing our fire risk.

At the rock-house no change has been effected, while the results have been similar to former years. The stamp mill has given the usual results, and except for the time spent in repairs during April and May, has had no delay. No unusual repairs have been made. But we are forced to call your attention to the condition of the boilers; these have been in almost daily use since the erection of the mill. We would recommend the purchase of new boilers, to be placed in a stone building to be erected outside the mill.

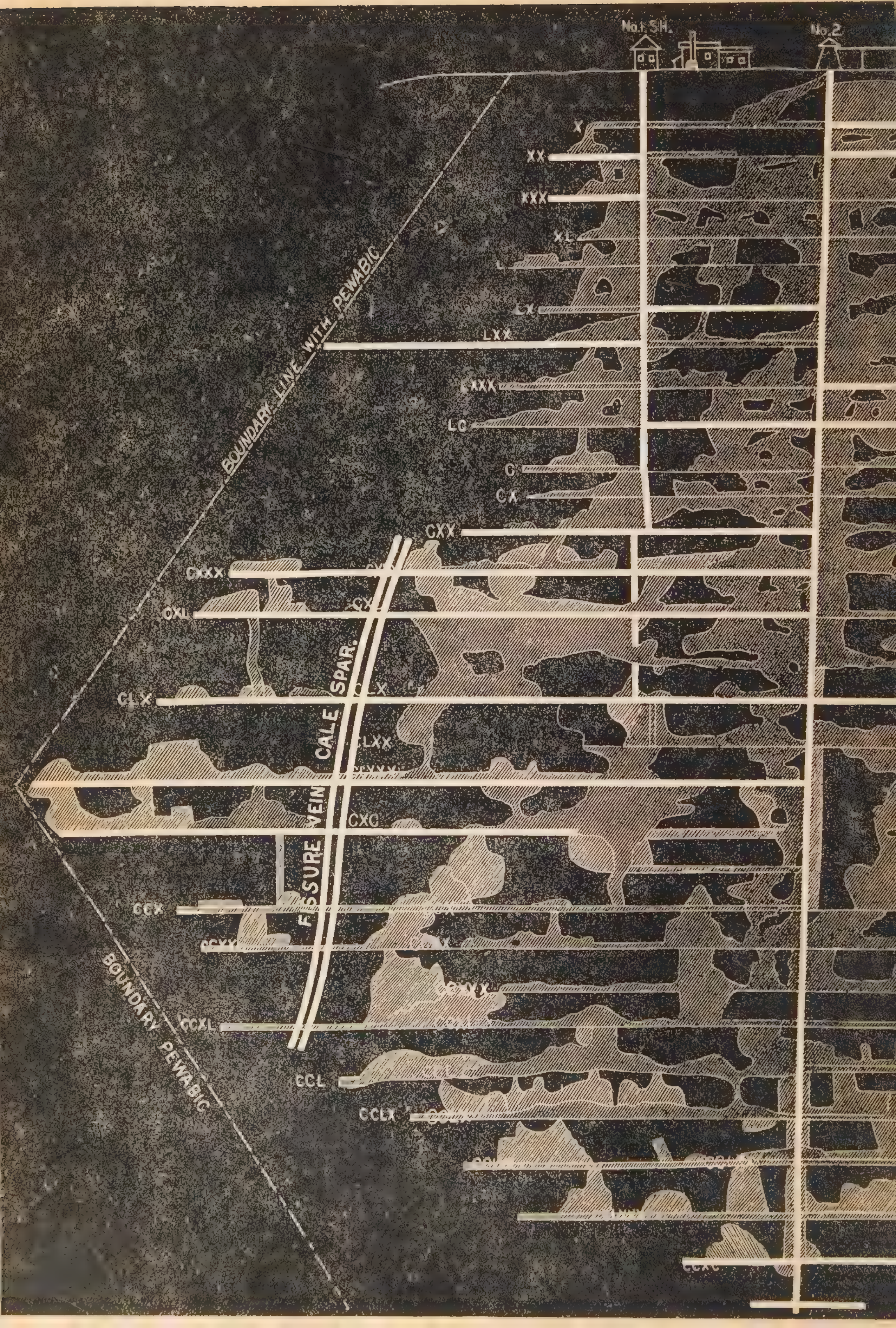
During the season of navigation the materials for the new dock were provided, and the labor of building was commenced early in the season, and the piling and dock surface will be completed during the coming season, though we expect the building of bulkhead and filling with waste sand will require several years to complete. We are pleased to be able to state that the plan has proved a full success, and will give us largely increased room for our waste sand.

Repair of our tenement frame houses has become imperatively necessary, to preserve and retain them in a habitual condition, and we expect to complete needed repairs during the year. The wagon road has been improved from Reservation street, in Hancock, to the mine, reducing the grades, and we expect a full return of cost in reduction of expense in the hauling of freight. We would strongly urge the extension of the same grade from the present terminus to the lake level.

The statements and tables forwarded by Mr. Kloeckner, Clerk, will show the cost in each department, and the mine plan, as made by Mr. L. G. Emmerson, C. E., will place before you the opening and stoping done since our last report, and will also show reserves fully equal to what they were at that time, while it

LONGITUDINAL SECTION O

Scale, 3



QUINCY MINE, JAN., 1883.

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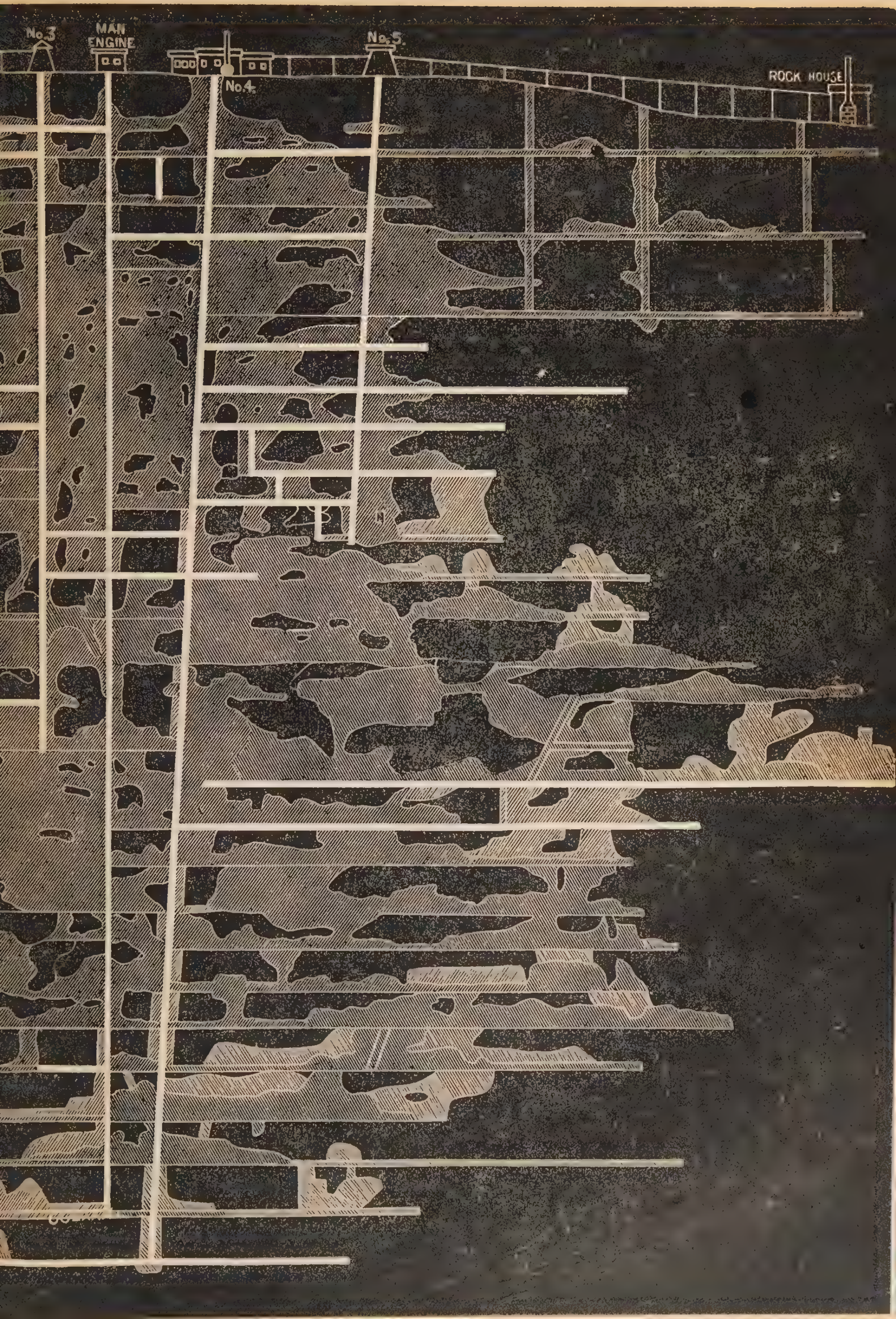


gives us much satisfaction to note that we are warranted in expecting continued good results for the present year, and to also commend the faithful discharge of duty of the associate officers at the mine.

F. G. WHITE, *Agent.*

HANCOCK MINING COMPANY.

The Hancock mine has never been a profitable one. It has been worked off and on for a long time, but no company or parties who have ever worked it met with any success in so doing. It was thought when it recently started, under so much more favorable auspices, that a more prosperous future was in store for it, but unfortunately the result, after a few years' trial, seems to be in keeping with the past history of the mine. The product for the year was 417 tons and 600 lbs. of mineral. The rock yielded about 1 per cent of mineral. It is all stamp work, and it all goes to the mill. There is not enough of it that is rejected to be worth noting.

One additional level has been sunk—to the 90th—the last year, and they are now sinking to the 100th fathom level. In the 80th they have drifted 480 feet north, and in the 90th have drifted 200 feet north and 200 feet south from No. 1, the only shaft used. There is one other shaft down to the 50th, but it is not used. The adit and the shaft are opened in two separate branches. The adit is east of the shaft 60 or 70 feet. A cross-cut was driven the past year in the 90th west 70 feet from the shaft, and cut a west branch, which is turning out better than the main vein. Have opened 250 feet in length in it; it is 18 feet wide. They have used the diamond drill in the mine the last year to some extent, but found nothing of value, except the side branch, which they are already working. The intention is to use the drill in this west branch for further exploration.

They mine enough rock to supply one Ball head, and find some difficulty to accomplish that with the present openings. A portion of the rock sent to mill might with advantage be rejected, but in that case the mill would not be kept supplied.

Average No. of men employed	110
An assessment of $1.50 was made May 25, 1882	$60,000

A Rand compressor has been added, and they run six air drills. The mine shows no improvement; perhaps it is neither better nor worse. Location joins the Quincy, S. W. ¼ of Sec. 26, T. 55, R. 34.

Product of the Hancock mine:

Years.	Tons.	Lbs.	Years.	Tons.	Lbs.
1861	17	-----	1872	27	360
1862	42	1,325	1873	44	1,132
1863	55	1,432	1874	30	1,365
1864	51	1,000	1875	14	229
1865	37	1,000	1876	-----	-----
1866	298	717	1877	-----	-----
1867	427	-----	1878	-----	-----
1868	80	-----	1879	3	1,294
1869	38	-----	1880	1	1,032
1870	203	1,731	1881	285	1,897
1871	29	1,710	1882	270	575
Total product				1,959	805

Business office, Hancock, Mich. Ed. Ryan, President; August Mette, Secretary and Treasurer; John Ryan, Superintendent.

COST OF EQUIPPING AND RUNNING THE MINE, APRIL, 1880, TO SEPTEMBER 1, 1882.

Debit.

Buildings and improvements		$56,491 00
Machinery		19,450 50
Supplies	$50,928 42	
Expense, teaming, horses, wagons, salaries	11,878 87	
Mining expense	101,052 16	
Surface "	31,422 77	
Stamp mill expense	16,369 81	
Smelting	11,737 96	
Freight	5,032 85	
Taxes	873 05	
Insurance	1,508 50	
Interest	2,831 70	
		233,636 09
		$309,577 59

REVENUE OF MINE.

Credit.

Proceeds sale of copper	$156,268 75	
" " lot	200 00	
Rent	1,674 84	
Pasturage	235 93	
Discount	12 39	
Assessments	100,000 00	
		$258,391 91

Mine owing, September 1, 1882, (net), as per statement below				$51,185 68
First National bank, Hancock			$10,000 00	
Due help, Superintendent and Secretary			2,100 00	
Edward Ryan			29,264 79	
Standard Bro.'s, Detroit, hardware		$238 65		
Cleveland Flue Cleaner Manufact'r'ng Co., flue cleaner		12 00		
Rand Drill Co., New York, air compressor and drill machines		4,277 50		
Backus Oil Co., Cleveland, oil		503 78		
John Senter, Eagle River, powder		2,863 75		
Toledo Oil Co., oil		88 20		
Sargent, Greenleaf & Brooks, Chicago, galvanized pipe for air compressor		738 98		
Babcock, Morris & Co., Cleveland, coal		5,241 52		
W. Bingham & Co., Cleveland, hardware		1,613 27		
			$15,577 65	
Gross			$56,942 44	
Less cash on hand, Sept. 1, 1882			5,756 76	
Net				$51,185 68
Mine owing, September 1, 1882, (gross)			$56,942 44	
Paid Toledo Oil Co.'s draft			88 20	
			$56,854 24	
Sundry purchases, supplies since September 1, 1882			936 41	
			$57,790 65	
Cash on hand, September 1, 1882		$5,756 76		
Paid Toledo Oil Co.'s draft	88 20			
Bought copper	1,176 84			
Sundry expenses	1,122 37			
		$2,387 41		
Cash on hand, September 16, 1882			$3,369 35	
Mine owing, September 16, 1882, (net)				$54,421 30

SHELDON AND COLUMBIAN MINING COMPANY.

The Sheldon and Columbian mine, situated within the village of Houghton, near the shore on the south side of Portage lake, might be of some value as a mine if it were united with the Grand Portage and Isle Royal. As it is there is not enough of it. It occupies the side of the bluff between the Grand Portage line and the lake in the east half of Sec. 36, T. 54, R. 34. The mine could be opened with a long adit from the level of the lake and extended through the Sheldon and Columbian workings and Grand Portage, and to the Isle Royal. Such an adit would not be dead work, as it would be driven in the lode and would prove the whole length of it, and furnish any amount of stoping ground. A small amount of tribute work has been done in the last year. Mr. Graham Pope of Houghton, Mich., has charge of the property. Product of the mine:

Years.	Tons.	Lbs.	Years.	Tons.	Lbs.
1865	36	912	1878	---	1,622
1866	66	1,497	1880	23	931
1867	309	946	1881	5	31
1868	166	1,118	1882	1	1,299
1869	93	368			
Total				703	724

GRAND PORTAGE MINING COMPANY.

There are two mines in the Grand Portage location, one in each of the lodes. A section of each of these mines is given, measured up to January, 1883. The lodes are parallel and distant apart 200 feet on the surface. The assumption has been that the lodes dipped at different angles and thus tended to come together and would finally unite, but from measurements of the angle of dip in both veins taken by myself I do not discover such to be the fact. The average dip is the same in each.

There were stamped 18,959 tons, which yielded 443 tons 1,666 pounds of mineral, and gave when smelted 378 tons 1,081 pounds ingot, being an average of 85.33 per cent. The stamp mill expense per ton of rock stamped was 62 cents. About one-half of the rock mined is rejected. The average number of men employed is 145, of whom 84 are miners, 24 trammers. The rock is all broken by hand, and it requires 12 men to do this work of breaking and assorting. The hauling from the shaft-house to the mill is done with three teams. Each takes three or four tons to a load. The work is limited to the capacity of the mill which can only work up 70 or 80 tons per day, 24 small stamp heads, which altogether do not do one-half the work of one Ball head. The underground work is let by contract, drifting per foot, $10.50. The company furnishes supplies and charges the men with them. Four men will use $55 worth of supplies per month and will drift between 24 and 32 feet. They average 27 feet per month. Size of drift 8x6 feet. The sinking of shafts costs $4.27 per foot; size of shaft, 8x12 feet. The stoping costs per fathom $17.50. The average wages the men earned in sinking was $55 per month. The average wages the men earned in drifting was $48 per month.

The stopes are carried 10 or 12 feet wide and the copper lies along the foot-wall. Breast stopes are let at $15, rising stopes at $20 per cubic fathom. Winzes average $12 per foot. All that can be of the broken rock that is not deemed of any value is left in the mine behind the stulls. The only timbering required is for this purpose of holding up the rock. The walls are good and enough pillars and barren ground are left to support the hanging. Only one man has been hurt in the mine since the new company started work. He had his leg broken. In the Portage lode they are down to the 7th level, two levels below the old working, 500 feet from the surface on the lay. The 5th level has been extended south 300 feet and 300 feet north, and they are still at work driving this level. To the south in this opened portion the last 50 feet is standing, the rest has been stoped away. To the north they have stoped 70 feet, and are still at work and find it very good. The 60th is the best level now opened in the mine. It extends 400 feet south and 200 feet north. Three hundred feet of this south drifting is more regular than has been heretofore found.

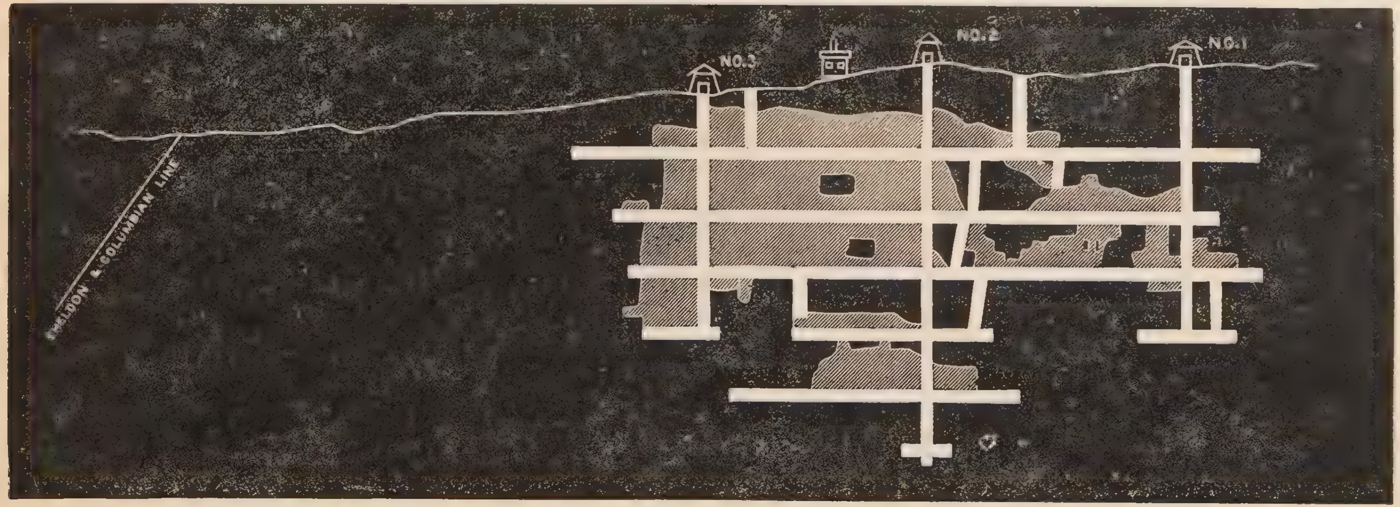
Sometimes in the mine a bar of trap heads entirely across the lode, and a set-off is made in the hanging to get around it. An instance of this kind is seen in the 5th level south of the shaft, and the set-off comes into good, productive amygdaloid. In the 6th level they have drifted 90 feet, and have 55 feet of back to the drift still standing, that is good; but north in this level it is not as good as it is south. A winze up to the 5th level at the north end shows the ground to be fair stamp rock. Between the levels this block is 50 feet in length. In the 7th they have drifted 50 feet each way from the shaft. It is not looking as well as it does in the 6th.

It is evident that the underground work cannot be pushed very vigorously with the present insufficient hoisting. The skip is delayed, and in every level where work is in progress the trammers may be observed standing idle, waiting for the skip. The engine has scarcely power enough to raise the skip from the bottom, and the rock-house floor is frequently encumbered with rock, which cannot be disposed of faster than the mill will work.

In the mine to the east, in the Isle Royal lode, work is also in progress, but the stopes are scarcely so well charged with copper as in the Portage mine. The bottom is the 6th level, 400 feet below the surface. In this level they have drifted south 300 feet from the shaft; 150 feet of it was worth stoping, and of this about one-half has been beaten away. North of the shaft they have drifted 150 feet, one-third of which will do to stope. They are still extending this level at both ends.

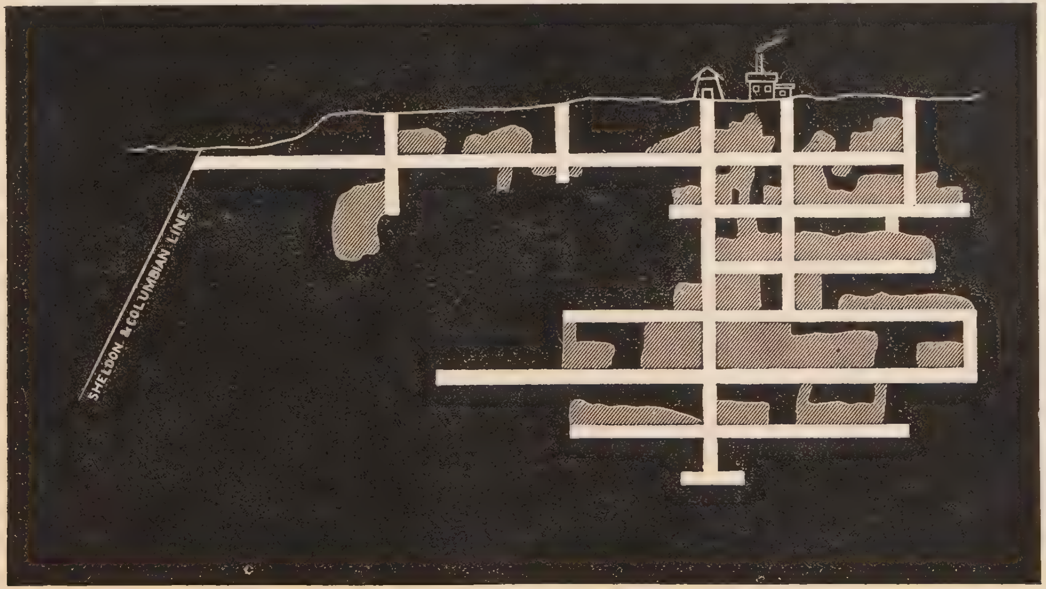
In the 4th they have extended north 200 feet, three-fourths of which is fair, but narrow. South of the shaft in this level the ground was all worked out as far as opened by the old company. It was also worked out in the 3d, but they have drifted north of the old workings 100 feet, and found the ground very good the whole distance, and stoped it out. The vein pinched up, and it was abandoned at this point. The 2d was underhand stoped for a length of 60 feet up the 1st, and in the latter they drove 30 feet north, and sunk to the 2d, and stoped out a block 70 feet long. This was done in the past year. The openings are ahead of the stoping, and shows that a fair mine could be made. Of the two lodes the Portage is probably the best; it is the widest—20 to 40 feet wide—and makes copper, generally, in some portion of the whole of it. The poor ground is most likely to be in the centre of the lode. The Isle Royal is much narrower than the other, although it makes out wide in places, and there are stretches of utterly barren ground. In the 5th they are driving towards the Sheldon and Columbian. The mine is probably about meeting expenses, as no assessments are made. They need a Ball stamp, a rock-house with breaker, rock hammer, etc., new hoisting machinery, compressor, and air drills, a tramway to the stamp mill. As stated in describing the Sheldon and Columbian, LONGITUDINAL SECTION GRAND PORTAGE MINE, EAST LODE, JAN., 1883.

Scale, 300 ft. to one inch.



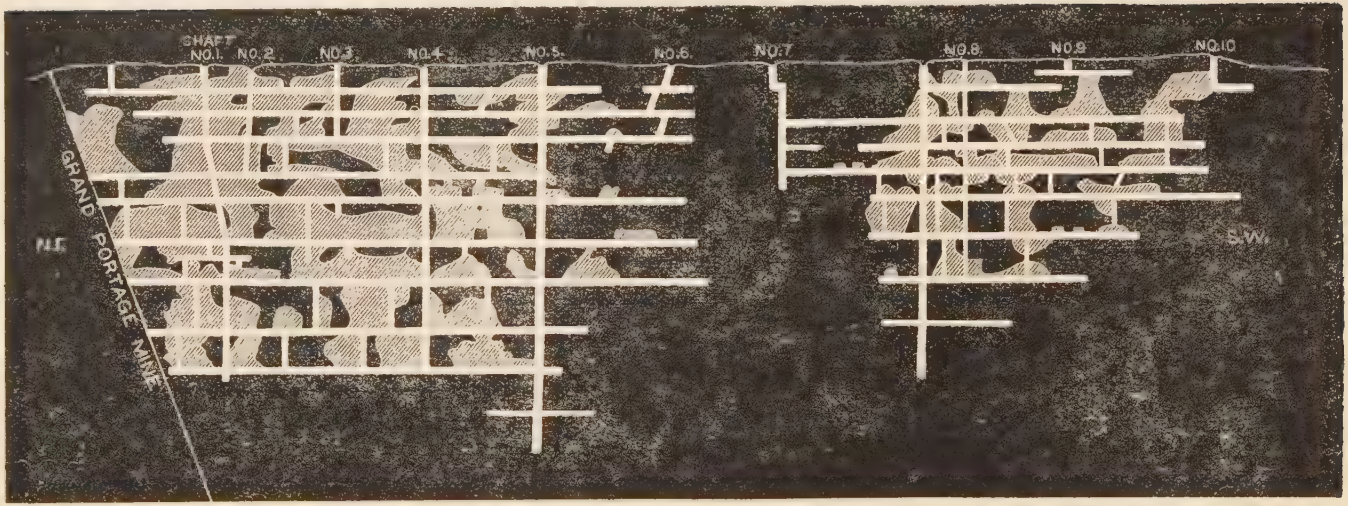
GRAND PORTAGE MINE, WEST LODE, JAN., 1883.

Scale, 300 ft. to one inch.



LONGITUDINAL SECTION OF THE ISLE ROYAL MINE.

Scale, 300 ft. to one inch.



the mine should be consolidated with that, and opened with an adit, or with the Isle Royal mine, and use the Isle Royal stamp mill and gravity road to it It is now working in a very out-of-date, obsolete manner. While it never can. be a rich mine, it might possibly be made a paying one with a more liberal and vigorous management.

The product of the Grand Portage is as follows:

Years.	Tons.	Lbs.	Years.	Tons.	Lbs.
1863	177	1,793	1878	17	124
1864	244	1,104	1879	17	1,423
1865	241	1,592	1880	38	1,860
1868	79	1,282	1881	13	264
1869	36	314	1882	378	1,080
Total				1,245	836

Business office, Hancock, Mich. Joseph Worden, President; Peter Ruppe, Secretary and Treasurer; Michael Shubert, Superintendent stamp mill; M. L. Tallon, Superintendent. The latter officer will be superseded by Wm. Tracy as Superintendent of the mine on April 1st, 1883.

ISLE ROYAL MINING COMPANY.

The Isle Royal mine remains idle and full of water up to the adit level. A small amount of tribute work was done, but nothing further. The Huron is working in the same deposit to the south and the Portage to the north, and the Isle Royal owners may be waiting to see the outcome of these undertakings. As will be seen by inspecting the map herein contained, the mine was extensively opened and worked. But the lode proved too poor—that is there was too large a proportion of poor ground. This belt carries considerable copper, but it requires a great deal of opening to get it. It is exceedingly irregular, with frequent "dykes" of trap that have to be gone through or around, occurring in the vein. The predominating mineral in the lode is epidote, and quite a proportion of the copper is in the form of small barrel work. The estimated length of the lode on the property is 3,500 feet. If the Isle Royal, Grand Portage, and Sheldon and Columbian were combined, the company would then have a length of vein of 7,000 feet. The adit level is 2,000 feet long. Product of the Isle Royal mine for past years:

Years.	Tons.	Pounds.	Years.	Tons.	Pounds.
Previous to 1855	58	----	1869	75	672
1855	93	----	1870	---	----
1856	232	1,124	1871	90	1,217
1857	210	117	1872	125	164
1858	178	810	1873	120	100
1859	208	56	1874	90	876
1860	168	198	1875	48	682
1861	458	1,274	1876	14	199
1862	448	139	1877	15	1,985
1863	360	1,841	1878	15	1,933
1864	291	386	1879	13	880
1865	344	1,836	1880	80	1,469
1866	308	1,336	1881	23	1,308
1867	381	852	1882	17	1,447
1868	147	1,033			
Total				4,578	1,933

The estate consists of the N. ½ of Sec. 1, T. 54, R. 34, and the N. W. fractional quarter of Sec. 6, T. 54, R. 35. F. W. Capin, Secretary and Treasurer. Office, New York. Graham Pope, Agent, Houghton, Mich.

THE HURON COPPER COMPANY.

The new company has gone systematically to work in the old mine, with the view of making it a paying mine, and they confidently express the opinion that the work so far justifies their expectation of ultimate success. While pushing the underground work Capt. Vivian has also greatly improved the surface outlook, and the location has again assumed the appearance of activity and thrift which it had in former days, ere its abandonment to ruin and decay. Prominent among the improvements is the new stamp mill which is now nearly completed. It is founded on the solid rock. Its location is 2,200 feet northwest from No. 9 shaft, and is 700 feet east of the dam, and is 9 feet above it, so that the water from the mill will run back into the pond from which it will be pumped into the mill. The stamp is a light one, same size as the one at the Wolverine mine, 15 inch cylinder and eight inch shaft. If another head is put in and an insufficiency of water is found, they can add to it by tapping the Pilgrim river, or a main branch of that stream, which can be diverted to the Huron mine at a moderate cost. They are not doing things on a large scale, but everything is well done, and the appointments will be complete so far as they go. They have also put in new friction-gear hoisting machinery, two hoisting drums 14 feet in diameter, made at Portage Lake foundry. The same engine runs the hoisting machinery and two rock breakers.

The rock thus far worked has been taken to the Pewabic mill, across Portage lake. A compressor has been added which runs 10 drills. The mill will be ready about the first of July. They operate two shafts, Nos. 6 and 8, and are working through a length of the mine of 1,200 feet. No. 8 shaft is below the 10th level, and No. 6 down to the 10th. The lode is very "pockety," irregular, wide and narrow in places. Some of the pockets are rich, but they are separated by long stretches of barren ground. The gangue is mainly epidote and calcite. About 15 per cent of the copper is barrel work, and about 50 per cent of the rock mined is rejected. The remainder yields about two per cent of copper. The average number of men employed by the company last year was 100. They are now working 150 men. The mine has been extensively worked in the past, but its entire history is a record of failure. Capt. Vivian hopes to chronicle now a final success. The section of the mine here shown is marked up to the close of the year 1882.

The office of the company is No. 19 Congress street, Boston, Mass. D. L. Demmon, Treasurer; Johnson Vivian, Agent, Houghton, Mich.

The mine joins the Isle Royal on the south, and is in the Isle Royal vein. The description is the S. ½ of Secs. 1 and 2, T. 54, R. 34.

The product of the mine has been as follows:

Years.	Tons.	Pounds.
1855	3	----
1856	12	----
1857	35	----
1858	24	----
1859	22	1,387
1860	4	1,000
1861	49	----
1862	69	1,305
1863	69	206
1864	50	1,745
1865	238	11
1866	----	----
1867	683	1,164
1868	740	80
1869	841	863
1870	42	183
1871	134	1,453
1872	276	1,684
1873	237	1,883
1874	125	1,005
1875	31	1,289
1876	31	1,857
1877	41	161
1878	32	1,100
1879	14	1,760
1880	35	285
1881	127	515
1882	182	579
Total product	4,156	1,525

The following report of the company gives the full details of the work for the past year:

ANNUAL REPORT OF THE HURON MINE.

Herewith you will find the agent's report of the doings at the mine the past year, and a statement of the cost thereof, together with the amount of mineral produced, etc.; also the usual statement of receipts and expenditures, and assets and liabilities, the latter showing a balance of liabilities, January 1, 1883, of $22,634.46, which was partly incurred for new machinery, "absolutely necessary to be had to carry on the works at the mine in an economical manner," and for work done on the new stamp mill, etc., which will be hurried forward as rapidly as possible, for our old mill is in such a condition that it is almost useless, and we are obliged to haul rock to Pewabic mill for stamping at a considerable extra expense.

It is fully believed by good judges that with our new mill, machinery, etc., in good running order, the mine will readily more than pay its way, and (with copper at present price) have very many chances of making a handsome profit on its operations. The company has a large and valuable property, and it only needs to be properly developed to fully substantiate this fact. Every known vein of the mineral range runs diagonally across it, and when the company is in condition to make explorations, there are many chances of finding valuable deposits of copper.

We have during the past year used our diamond drill in exploring on a conglomerate vein on our property, but with no good result, and the rise in the price of diamonds led us to discontinue explorations in that direction for the present. At some future time work will be recommenced, and, we trust, with better results.

During the year the mine produced 445,624 pounds of mineral, which gave a yield, at smelting works, of 82 113-1000 per cent, producing 364,037 pounds ingot, most of which has been sold at a fraction over 18 cents, as will be seen by cash account.

The openings in the mine, and mine work done for same period, are as follows:

Number of feet sunk in shafts	269
" " " winzes	261

Number of feet drifted, 885 6-100, which cost, including timber supplies, wood, etc., etc.	$57,626 87
The expense on surface, machinist, carpenters, etc., and hauling rock, etc., etc., was	19,581 80
Expense at old stamp mill, and stamping rock at Pewabic mill, was	10,018 39
Diamond drill expense	695 46
Construction expense	4,380 28
All other expenses, including office, insurance, taxes, etc., etc.	6,329 48

Eight thousand five hundred and fifty-two tons of rock were stamped, giving a yield of 2 52-100 mineral.

There is in mine broken, ready for hoisting, about 1,500 tons of rock.

Respectfully submitted,
D. L. DEMMON, *Treasurer.*

OFFICE OF THE HURON COPPER MINING COMPANY,
HOUGHTON, HOUGHTON COUNTY, MICHIGAN,
January 10th, 1883.

DEAR SIR,—I beg leave to submit the following report of our operations, with annual cost sheet and inventory, for the year ending December 31, 1882:

SURFACE WORK.

In this department we have made the following improvements: A dwelling-house for the assistant mining captain, house for pumping engine, with new foundation for both engine and pump, compressor-house, addition to blacksmith shop, which is used for storing iron, coal, etc., two sheds over rock breakers at Nos. 6 and 8 shafts, also two rock bins. Fifteen hundred feet of embankment for railroad from the mine to the mill has been made, and 1,475 feet of ditch dug, through which we shall bring clean water for feeding the boilers at the stamp mill, We got started on the stamp mill about the first of December, and so far have done very well. We have all the men that we can conveniently work on it, and hope to have it completed early in the coming season. We are arranging the machinery so that another head of stamps can be put in the same house without any addition to same.

MACHINERY.

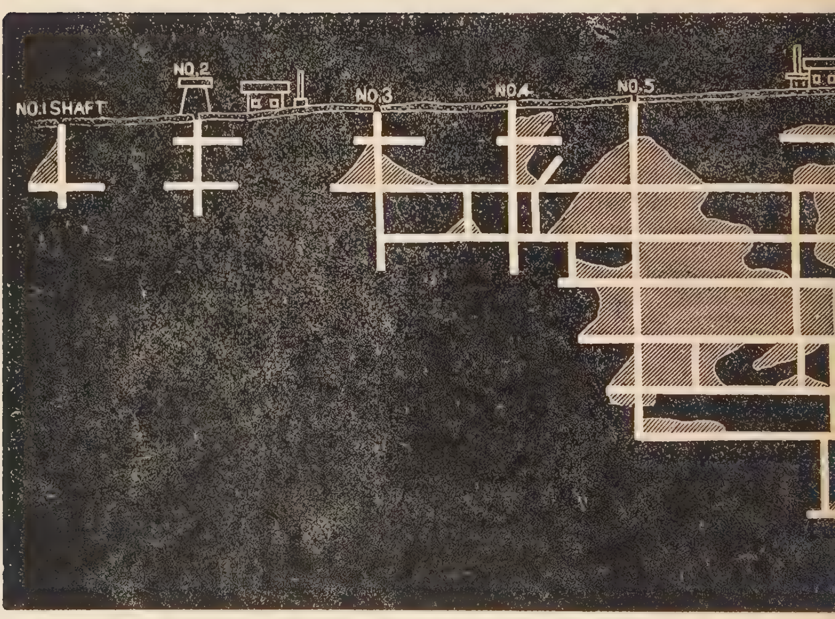
Two rock breakers, one at No. 6, and the other at No. 8 shaft, have been put up, which are operated by transmission of power by wire rope from the hoisting engine. A duplex air compressor has been erected which has a capacity to run fourteen drills and two pony engines. We have ten drills now running full time. Four more will be added to the above in the spring. We have purchased for the machine shop a lathe suitable for doing drill work, and a bolt cutter, which has made this department equal to our wants for many years. We shall do all the repairs in this shop for both mine and mill.

MINING WORK.

No. 8 shaft has been sunk from the 9th to a point 35 feet below the 10th level. The lode, for the entire distance, contains stamp copper, some portion of which will pay to stope. The best piece is from about 30 feet above the 10th level to the present bottom. The 10th level has been opened south of the shaft 90 feet, in ground that will pay to take out. This level has been extended north of the shaft 30 feet, and, so far, is poor. The 9th level has been extended south

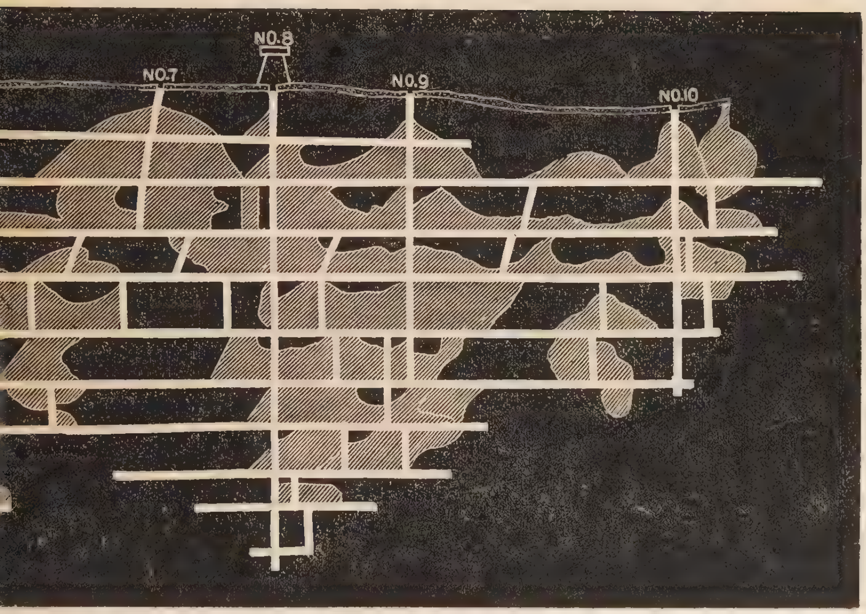
LONGITUDINAL SECTION

Scale,



HE HURON MINE, JAN., 1883.

o one inch.



180 feet. The first 140 feet exposed a fair lode for stamp mineral, but the last 40 feet are very lean. This level has been opened north 120 feet, without exposing anything of value. No. 6 shaft has been sunk from a point 35 feet below the 7th level to the 10th level. The lode in this opening, until it reached 40 feet below the 9th level, is showing well in stamp and barrel copper, but the last 40 feet sunk are poor. The 9th level has been opened north 165 feet. The first 90 feet from shaft will pay to stope, but the balance of this opening is poor. This level has been opened south 105 feet; about 70 feet near the shaft exposed a fair amount of stamp copper, but the last 35 feet of this drift is unproductive. In a winze, sunk 60 feet north of this shaft, from the 7th to the 9th level, the lode is large and well filled with stamp mineral. The 7th level has been extended north of the shaft 180 feet; for the first 80 feet the lode is from 8 to 10 feet in width, and contains a little stamp work; some parts of it will yield copper in paying quantities, but the last 100 feet the lode is from 18 to 20 feet in width, and rich in stamp and barrel copper. With a few such pieces of ground to work on, the Huron would soon assert itself as a big producer.

FUTURE PROSPECTS.

It seems that the prospects for the future depend upon the amount of ground that is kept opened ahead of the stopes, for, as you are doubtless aware, the copper is found in bunches in this lode, which makes it necessary to have a large amount of ground opened so that the best pieces can be worked, and the balance discarded. If the bunches of copper that have been discovered in the different parts of the mine continue, and the openings are kept well ahead, so that these deposits of copper can be made available, there is no doubt, in my mind, about the success of the Huron. For further information in relation to our business, I beg leave to refer you to the clerk's report, and the map of the mine, which I send herewith. Captain P. H. Odgers is still with us, and has faithfully discharged the duties of his office.

I am yours, respectfully,
J. VIVIAN, *Superintendent.*

ASSETS AND LIABILITIES OF THE HURON COPPER MINING COMPANY, JANUARY 1, 1883.

Assets.

Cash on hand January 1, 1883	$2,425 94
Copper do. 71,537 lbs. (since sold) 18c	12,876 66
Supplies at mine	30,207 66
	$45,510 26

Contra. Liabilities.

Due for loans	$21,500 00
" drafts	20,582 34
" smelting	863 57
" freight	612 48
" forfeited stock	134 16
" liabilities at mine	23,452 17
	$67,144 72
Less assets, as above	45,510 26
Showing a balance of liabilities of	$21,634 46

Which is offset by additions to machinery, during the year, in shape of compressors and air drills, diamond drills, labor, and machinery for new mill, etc., etc.

The valuation of machinery, tools, etc., etc., of the company, January 1, 1883, as per agent's estimate, exclusive of real estate is, as per detached statement annexed, $124,201 41.

E. & O. E.

CASH RECEIPTS AND EXPENDITURES OF THE HURON COPPER MINING COMPANY, FOR THE YEAR 1882.

Cash on hand January 1, 1882	$21,701 23
Cash from sales of copper :	
1881 copper, 25,439 lbs., at 20 237-1000	5,157 25
1882 copper, 292,500 lbs., at 18 355-1000	53,687 37
Cash from interest account	584 73
" " loan	54,000 00
" " rebate on freight	103 88
	$135,234 46

Contra.

Cash paid mine agent's drafts	$90,812 10
" " loans	32,500 00
" " interest, expense, taxes, insurance, storage, etc.	3,300 11
" " smelting and freight	5,511 81
" " mine account, castings	100 00
" " copper charges and brokerage	564 67
" " forfeited stock	19 83
" on hand January 1, 1883	2,425 94
E. & O. E.	$135,234 46

AGENT'S VALUATION OF THE MACHINERY, ETC., AT THE MINE, EXCLUSIVE OF REAL ESTATE.

Tenement houses	$17,825 00
Barns and work shops	10,150 00
Machinery buildings	23,800 00
No. 6 and 8 shaft house	3,078 00
At barn	1,865 00
On surface	1,914 30
Men's changing house	45 00
At old stamp mill	6,030 00
" No. 10 engine	2,090 00
" pumping engine	2,013 00
" No. 6 engine	11,614 00
" carpenter's shop	231 50
" new mill	2,452 89
" blacksmith shop	2,321 67
" machine shop	5,026 49
" compressor house	5,012 00
" old rock house	1,950 00
" warehouse	4,862 68
" agent's house	336 00
" machine shop and cellar	1,076 65
" engineer's room and office	398 25
" captain's office and warehouse	378 42
In mine	18,005 91
At powder house	1,384 64
Wood land near mine	340 00
	$124,201 41

THE ATLANTIC MINING COMPANY.

The Atlantic mine in one important particular is more like the Calumet and Hecla than any other copper mine in the State, and this is in the uniformity and regularity of the lode. In both mines the vein rock all goes to the stamp mill. It is all taken down except the pillars; but still, they stand at opposite ends of the list. The Atlantic rock averages the lowest in copper, and the Calumet and Hecla the highest of any of the important mines. The Atlantic mine is becoming noted over the world among those who interest themselves in mining matters, for the fact of its yielding such a low percentage rock, and yet the company is able to prosper and pay dividends. The reason that it can do this is due to several facts; of the uniformity of the lode, that is, to the fact that it is sufficiently uniform, that it is not selected, it is all taken down and all sent to the mill; it is a soft amygdaloid trap that is easy to drill, neither wearing on the drills nor the stamp head; the width and dip are both the most advantageous, the average of the former being 15 feet and the latter 45 degrees. At such a pitch the rock requires no extra handling, it rolls down of itself against the stulls, and at the same time it is not so steep as to require any staging. The character of the lode is such that it is as easy to get out a large product as a small one, and the general equipment, the hoisting machinery, etc., transporting facilities, and stamp mill are all equal to the most economical handling of a large product. The mine was fully described in the commissioner's report for 1881, and there is nothing to add further than to chronicle the year's work, prefaced with a few general descriptive facts.

The extreme length of the mine is 3,290 feet from north to south. No. 1 shaft is at the north end of the mine, and it is sunk to nearly the 4th level, 265 feet from the surface on the underlay. The 1st and 2d levels have been driven north of the shaft 200 feet, and the first one is connected with No. 2 shaft—distant from No. 1, south 740 feet. The 5th level has been driven north during the past year nearly to No. 1 shaft, also the 7th level is driving in that direction, and is about one-half the way—the added length being 240 feet. No. 2 shaft is down to the 10th—800 feet in depth—and is connected with No. 3 in all the levels. No. 3 is down to the 12th—1,000 feet deep. No. 4 is 450 feet south from No. 3, and is sunk to the 11th level. The 4th, 5th, and 6th levels are driven south of it 1,190 feet.

An inspection of the map shows how little opening there is as compared to other mines. The openings are not carried ahead of the stoping; the lode is taken down and trammed away as fast as it is reached; the drifts and stopes are carried along together. The only sinking that is done is in No. 3 shaft. That is lowered a lift and the drift extended each way to No. 2 and No. 4 shafts. The longest drifts to the south are to within about 400 feet of the line, and the ground at the ends of the drifts is poor, so that there is no inducement to extend further in this direction. The ground proves to be profitable to work for a distance south from No. 4 of about 1,000 feet; beyond that it is broken up and does not pay. No. 1 shaft was poor and was abandoned, and is now filled with water up to the 1st level. The 5th level driven north from No. 2 shows better, as does also the 7th, and this block of ground between the 5th and 7th seems likely to prove available for stoping. They will also push north from No. 2 in the lower levels.

The bottom of the mine looks the same as it did a year ago; there is no apparent difference. The vein is not all alike—does not carry copper uniformly. Sometimes the product runs down pretty low—due to poor stopes—but again it comes up, and the general average keeps about uniformly the same. The product for the last year was greater than it was the year before. This was accomplished by sending a larger quantity, daily, of rock to the stamp mill—630 tons. In 1881 it was 600 tons, and doing it with a lower average per cent of cost.

The entire arrangements for doing the work at the Atlantic mine are exceedingly well planned; the greatest economy is studied. The railroad is three miles in length, and is so operated that the rock is transported at the least cost. At the stamp mill the expenses are at a minimum. The main track runs out on a trestle in the side of the hill above the mill. The cars discharge into the rock bins, which are provided with shutes at the bottom, under which the cars, working automatically on the gravity incline, are placed to receive their load. These automatic gravity inclines are double, a set for each stamp head, and connect the stamp heads with the rock bins. The loaded cars draw up the empty ones, and they discharge into the shutes that feed the stamp heads. The mill has 10 Evans slime tables; one has recently been added. Work 17 air drills, Rand, No. 2. There is no hand drilling. Stamped 189,800 tons of rock, which gave 3,768,735 lbs. of mineral—19 85-100 lbs. per ton of rock. A cross-cut was driven in the 9th level 100 feet north of No. 3 shaft 106 feet, 40 feet of which was trap, coming then into amygdaloid, which carried a little copper. The amygdaloid was 25 feet through, and was succeeded by a belt of conglomerate 26 feet wide with no copper, followed by sandstone, thence a clay loam, after which, trap.

The location of the mine is the S. ½ Sec. 4, and the N. ½ of Sec. 9, T 54, R 34. The officers are, Jos. E. Gay, President; John Stanton, Treasurer, New York; Wm. Tonkin, Agent, Houghton, Mich. The section of the mine is marked up to January 1, 1883.

The following table shows the product of the mine:

Years.	Tons.	Lbs.
1866	6	1,475
1867	-----	1,760
1868	764	258
1869	823	857
1870	186	617
1871	-----	-----
1872	-----	-----
1873	431	1,336
1874	686	403
1875	783	1,036
1876	917	1,041
1877	1,027	304
1878	1,132	1,592
1879	1,153	1,822
1880	1,170	1,195
1881	1,264	9
1882	1,315	1,708
Total	11,664	1,446

The following report of the company shows all the details of the work for the year 1882:

ANNUAL REPORT OF ATLANTIC MINE.

The directors present the following statement of operations during the year 1882:

The production of mineral was 3,768,540 pounds, which yielded 69 83-100 per cent, or 2,631,708 pounds of refined copper. The shipments to market during the year amounted to 2,634,675 pounds, for which—estimating the amount on hand at the close of the year at 17 cents per pound—there has been realized an average price of 17 56-100 cents per pound. The following is a summary of the year's business:

Production.

Copper sold	1,734,356 lbs.,	at 17 84-100 cents	$309,469 92
“ on hand	900,319 “	at 17 cents	153,054 23
	2,634,975 “	average 17 56-100 cents	$462,524 15

Copper at smelting works, December 31, 1881,	$46,815 36	
" " " " 31, 1882, 288,379 lbs., valued at 14 cents net	40,374 06	
		$6,142 30
Net value of product of 1882		$456,281 85
Add balance of interest account		3,855 67
		$460,137 52

Costs.

Expenditure at mine, as per clerk's tables	$305,246 00	
Smelting, freight, and all other expenses, as per balance sheet	56,933 49	
Net operating expenses		362,179 49
Showing a profit in 1882 of		$97,958 03
The surplus from 1881, after payment of dividend, was		240,691 64
Making a net surplus, December 31, 1882		$338,649 67

As shown in detail in the annexed statement of assets and liabilities. From which a dividend of $2 per share ($80,000) was paid February 1, 1883.

We append the usual statement of the amount and cost of the work performed in each department. The changes from the figures of the previous year are not very material, yet on the whole indicate a further reduction on the average cost per ton of handling the product. The operations at the mine have been regular and uninterrupted, nothing having transpired to call for special comment, and we refer to our agent's report for details of the year's work.

JOSEPH E. GAY,
CHAS. J. STARR,
JOHN J. CRANE,
GEO. A. HOYT,
JOHN R. SURDAM,
JOHN STANTON,
Directors.

NEW YORK, March 13, 1883.

BALANCE SHEET, ATLANTIC MINING COMPANY, DECEMBER 31, 1882.

Real Estate.

Mines, railroad, stamp mill, and machinery, as valued at consolidation	$659,642 11	
Woodlands purchased	16,664 41	
		$676,306 52
General expenditure previous to 1882		3,217,616 70

Expenditure in 1882.

Atlantic mine	$314,947 69	
Freight	12,909 10	
Smelting	34,093 15	
Insurance	1,735 34	
Brokerage	2,307 89	
Storage	52 50	
Expenses	5,835 51	
		371,881 18
Dividends		140,000 00
Cash		47,109 75
Loans		30,000 00
Copper on hand (900,319 lbs.)		153,054 22
		$4,653,968 38
Capital stock as consolidated (40,000 shares of $17 50 paid in)		$700,000 00
Assessment on stock of Adams mining company		853 15
Assessments Nos. 1, 2, 3, 4, and 5		280,000 00

Sales of Copper.

Sales previous to 1882	$2,179,138 44	
Sales in 1882	462,524 15	
		3,641,662 59
Accounts payable		9,596 97
Interest		3,855 67
		$4,635,968 38

ASSETS AND LIABILITIES ATLANTIC MINING COMPANY DECEMBER 31, 1882.

Assets.

Cash		$47,109 75
Loan		30,000 00
Copper on hand, 900,319 lbs. valued at 17 cents		153,054 23
" at smelting works, 288,379 lbs., valued at 14 cents net		40,373 06
		$270,537 04
At Mine.		
Cash	$1,121 78	
Coal	22,570 00	
Wood	2,914 00	
Supplies	27,287 53	
Merchandise in store	50,993 60	
		104,886 91
Total assets		$375,423 95

Liabilities.

Indebtedness at mine	$20,995 86	
Agent's drafts outstanding	6,181 45	
Accounts payable	9,596 97	
		36,774 28
Balance of assets		$338,649 67
Less dividend, payable February 1, 1883, $80,000.		

STATEMENT OF WORKING EXPENSES AT THE ATLANTIC MINE FOR THE YEAR ENDING DECEMBER 31, 1882.

Underground Expenses.

Sinking 29.5 feet, average $15.57	$459 50	
Drifting 2,801.5 feet, average $10.05	28,153 30	
Stoping 9,773 184-216 fathoms, average $10.65	104,136 21	
Timbering, tramming, and labor	43,238 63	
Timber, materials, and supplies	6,776 94	
Less profit on supplies	24,976 92	
		$157,787 56

Surface Expenses.

Superintendence, and labor of all kinds, less sundry credit items	$36,778 88	
Supplies and materials	7,541 04	
Fuel	18,146 19	
Feed for teams, etc.	913 70	
Fire insurance	300 00	
Taxes (two years)	6,621 33	
	$70,301 14	
Less amounts received for rents	3,442 11	
		66,859 03

Railroad Expenses.

Labor	$6,435 67	
Fuel	2,650 00	
Supplies	930 34	
	$10,016 01	
Less amount charged for hauling freight	708 70	
		$9,307 31

Stamp Mill Expenses.

Labor	$26,060 39	
Fuel	33,276 78	
Supplies	10,375 03	
Insurance	600 00	
Expense	42 80	
		70,355 00

Construction Account.

Vault at office	$332 00	
One Rand drill	300 00	
New house for locomotive "Globe"	55 00	
One Evans slime table at mill	250 00	
		937 00
Total expenditure at mine		$305,246 00

SUMMARY OF RESULTS.

Rock stamped, tons,	189,800
Product of mineral, pounds,	3,768,540
" refined copper, pounds,	2,631,708
Yield of refined copper, per cubic fathom of ground broken, pounds,	259
" rock treated, 13 866-1000 pounds copper per ton, or, per cent	.693
Gross value of product, per ton of rock treated	$2 40.40
Cost per ton, of mining, selecting, and breaking, including taxes, all surface expenses, and construction account	1 18.85
Cost per ton, of transportation to mill	4.90
" " " stamping and separating	37.07
" " " freight, smelting, and marketing product, including New York office expenses	30
Total expenditure, per ton of rock treated	$1 90.82
Net profit, per ton of rock treated	49.58
Profit per ton of rock, including interest earned	51.61

ATLANTIC MINE, L. S., MICH.,
January 1st, 1883.

DEAR SIR,—The following is a statement of the work done, and the results of the same, for the year ending December 31st, 1882 :

No. 2 shaft has been extended to the 9th level, in good working order.

A quantity of rock has been broken over the 9th level south of No. 2 shaft, but very little has been done north of the shaft.

Nothing has been done in the 8th level north of No. 2 shaft, but very good rock has been taken from the stopes south of the shaft.

The 7th level has been extended 436 feet, and a large quantity of rock has been broken from this "back;" we have taken more "barrel copper" from this level during the past year than from all other parts of the mine.

The 5th level has been worked with fair results, but the ground has not been as well charged with copper as in the 7th. The length of this level is 614 feet, and the north end is at present about 110 feet from the line of No. 1 shaft. The end of the drift is looking well, showing a quantity of calc-spar and barrel copper, similar in appearance to the ground in the botton of No. 1 shaft, when it was last worked. Nothing has been done above this level during the year.

No. 3 shaft has been put in working order to the 12th level, and we shall sink it to the 13th level this winter. The 12th level has been drifted north and south of the shaft, and its present length is 366 feet. A large quantity of rock has been taken from the "back" of this level, which yielded good results.

The 11th level has been extended 379 feet north, and to No. 4 shaft south; most of this "back" has paid for stoping.

The 10th level has been extended north to the point where No. 2 shaft will intersect it, and we have a rising stope to connect with the shaft at the 9th level.

No. 4 shaft has been connected with the 11th level, and this level has been extended 107 feet south of the shaft through very good ground.

The 10th level is 500 feet long south of No. 4 shaft, and very fair stamp rock has been taken from this back.

The 9th level south of No. 4 shaft is 842 feet long, the 8th level, 1,038 feet, and the 7th, 1,075 feet. Some little stoping has been done in these, but not with such good results as in the middle part of the mine.

The number of feet sunk is	29.6
" " " drifted on lode is	2,705.5
" " " " " cross-cut is	96
" " cubic fathoms stoped is	9,773 184-216
" total number of cubic fathoms broken in openings and stopes is	10,170 172-216

In the No. 3, or pump shaft, we have taken out the drawing pumps from the 8th, 9th, and 10th levels, and put in a plunger, or force pump, to heave to the 7th, and have put in a drawing pump to heave to the 10th level. All the pumps and skip-roads are in good working order.

STAMP MILL.

The mill has stamped and treated 189,800 tons of rock, at a cost of 37 7-100 cents per ton. The yield of the rock has been 19 855-1000 pounds of mineral, or 13 866-1000 pounds of refined copper per ton. The stamps and other machinery have done the work very satisfactorily.

RAILROAD.

The railroad is in good order. There have been transported over the road 189,800 tons rock at cost of 4 9-10 cents per ton, 709 tons freight have been carried from the dock to the mine, the cost of which has been charged to the different accounts for which it was used. We have done a good deal of ballasting, and put in 507 new ties.

MACHINERY AND BUILDINGS.

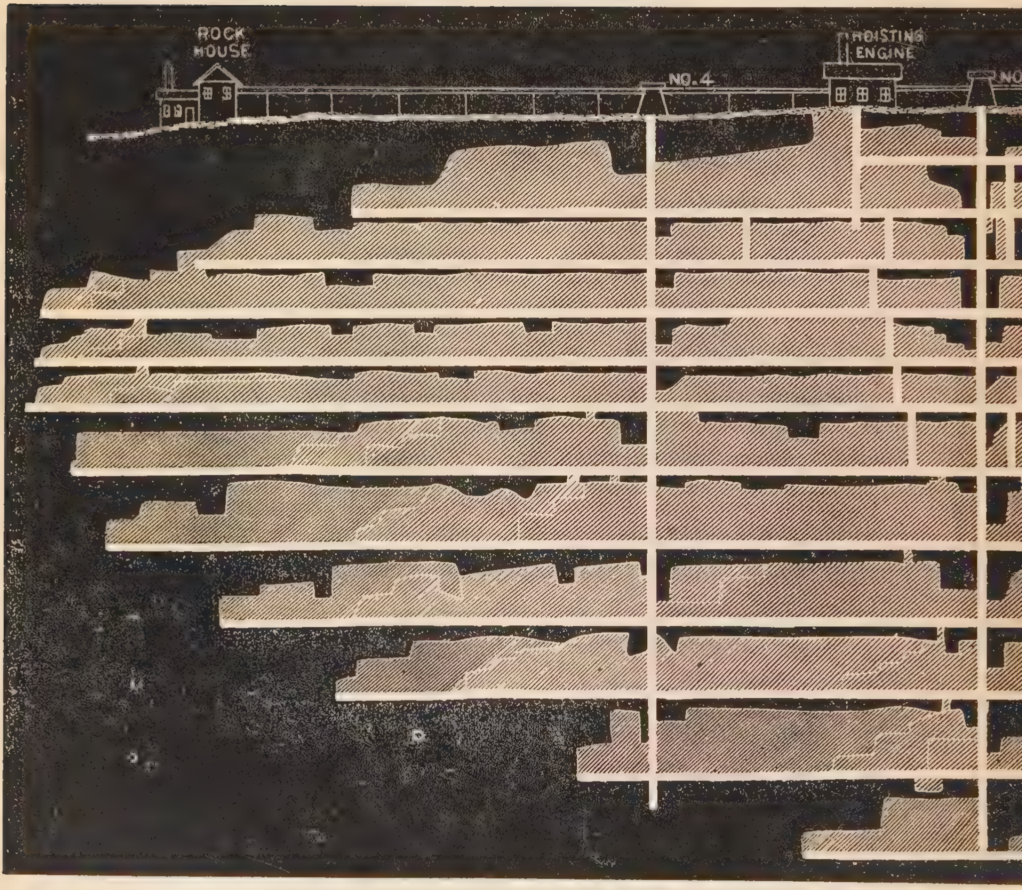
All of our machinery is in good working order. We have done a considerable amount of repairing to our dwelling-houses, and fitted up a car house (not needed for that purpose) to contain our supplies.

Construction during the year consists of the following: A fire-proof vault connected with the office, one new "Rand" drill, one "Evans" slime table at mill, and a house 25x14 feet, at the railroad, to contain the small locomotive, for which at present we have no use.

It has been decided to erect a machine shop at the mine in 1883, with tools

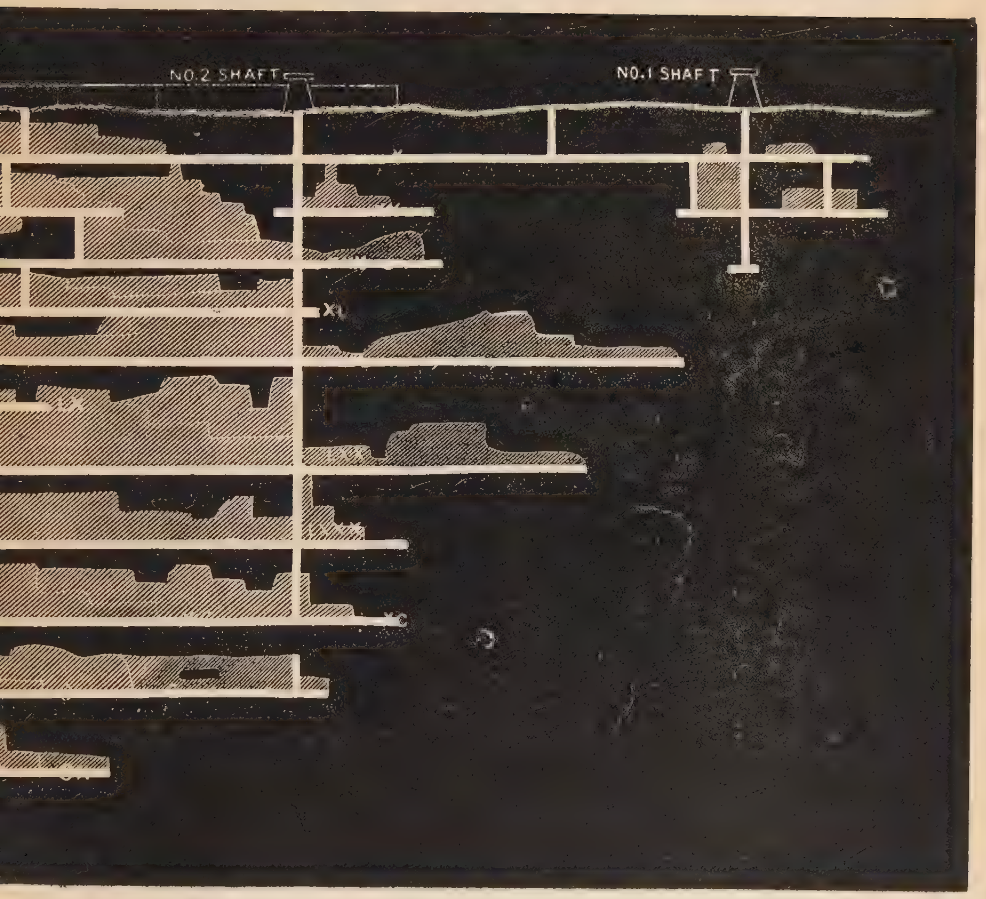
LONGITUDINAL SECTION OF

Scale, 30



TLANTIC MINE, JAN., 1883.

inch.



sufficient to perform the work of the mine, the necessity for which has become more urgent since the introduction of power drills, which require constant repairs. We shall also lengthen our dock at the lake, for the better accommodation of steamers, and shall build a new "tail house" at the mill, as we shall have to carry our sands in a different direction from that where our "tail house" now stands.

The clerk's tables, and a plan of the mine plotted up to date, will, I think, afford all the other information you may require.

WM. TONKIN, *Agent.*

ONTONAGON COUNTY MINES.

NATIONAL MINE.

The operations at this mine have now reached a point where they will be regarded with increased interest. The mine was finally freed of water on December 15th, last, exactly two years from the date at which the pump was first started. It has proved a long, troublesome task, not so much from removing the water as in cleaning out the rubbish and in straightening and lining up the shaft. The shaft was filled from the adit level to the bottom of the mine with refuse rock and timber, etc. Everything found in the mine that the tributers wanted to get rid of was dumped into the shafts. They are now in the 100th fathom level, the bottom of the mine. The pumping engine that has served to raise the water, is the one that was first set up—20-inch cylinder, 6 feet stroke—and the pipe carried down is 14 inches diameter. It will be remembered that when the work of reviving the National, in May, 1880, was begun, that there was not a building on the location that was not fairly on the road to ruin, and all those at the mine, except the stone change-house, were torn down and got out of the way. New buildings have been erected of a very substantial character, consisting of two large and substantial shaft-houses, commodious boiler-house, and building for hoisting machinery, both with stone walls, a compressor building, etc. The dwelling houses, office, etc., belonging to the company have been repaired and painted, so that all now have a substantial look. The machinery is all placed on solid rock foundations, and is built to stay.

For a depth of 250 feet from the surface the National must drain also the Minesota and the Rockland mines, making an entire length of drainage of one and a fourth miles. Since reaching the bottom a large "plat" has been blasted out around the shaft, to afford room for future sinking, and a large pump has been sunk to keep back the water. The last 200 feet of drainage was done with the bucket pump, and they are now changing to substitute for it the permanent plunger. Also the work is now in progress of providing this same portion of the shaft with a skip-road. The entire bottom level, as far as it has been opened, 700 feet in length, is unbroken by stoping, except a small amount east of No. 2 shaft, and also an equally limited amount to the east of No. 1 shaft, where the track and pump are completed. Stoping may be begun in the back of this level, and a new block of ground opened up, by sinking the shaft to the 11th level and drifting eastward below the 10th level.

The upper levels have collapsed—gone together—and filled up. No attempt has been made to explore any of them; to do so would be equivalent to driving them anew, or worse. There is no great probability that enough copper would be found in these old workings to pay for the cost that would result in opening them. The portion of the mine that has been unwatered is the east end next to the Minesota, that part of the mine that was opened in the ground regarding the title to which a long and costly legal contest arose. Previous to the settlement of this suit the National company had been working in the same vein to the west, west of No. 4 shaft. When the title was finally awarded to them, all work was transferred to this coveted ground, and the work in the west end of the mine, which was then abandoned, was never since renewed. It was at the time when the Minesota was at the hight of its glory, and the National naturally desired to participate in the bonanza. The richest ground in the Minesota was adjoining this disputed territory, and it was reasonably assumed that the copper must carry to the west of the boundary line dividing the properties. This assumption was borne out by the fact, and this ground during the subsequent years that the mine was worked yielded abundantly.

The mine was opened in a contact vein, that is in a vein underlying a belt of conglomerate, in which it was in contact, and overlaid to the north with trap, which extends 140 feet, when occurs a belt of amygdaloid of moderate width, again succeeded by trap. In the early days of working the National the conglomerate vein was designated as the south vein, and the amygdaloid as the north vein. The latter was not extensively worked, but deeming it best to prove it at a greater depth than had been tested, and also to explore the intervening ground, a cross-cut was made to the north from the adit level, that intercepted a theretofore unknown vein, which on being drifted in proved productive, and was designated the middle vein. This cross-cut was between No. 2 and No. 3 shafts, and this so-called middle vein when discovered was supposed to be the continuation of one which had been found to occur in a similar manner in the Minesota, and was in that mine proving to be very productive.

It was found, however, on following this newly discovered vein that instead of running parallel with the formation it extended counter to it, that is it ran diagonally across the trap belt, northwesterly from the conglomerate, and being vertical, and the formation dipping north, the line of contact of the plane of this counter vein with the conglomerate and amygdaloid planes makes constantly to the west in its extension downwards. At the surface this point of intersection is 80 feet west of No. 1 shaft, but at the bottom it is nearly as far west as No. 3 shaft. This counter vein was worked out between the conglomerate and the amygdaloid to the bottom of the mine, and was reached by cross-cuts from the south vein—the one of which the longitudinal section is given—which were run from each successive level.

From this vein was derived a large portion of the copper which the mine afforded, especially from along the line of contact. A fissure in the conglomerate, which occurs just west of No. 3 shaft and extends downward paralel with it, also contributed well in the past, and the purpose now is to reach this fissure in the bottom level, and to sink in it to the line of its intersection with the counter vein, which will be at a distance of about 100 feet below the present bottom. It is conjectured that the ground at this point of intersection will be found to be rich in copper, as such a result accords with the usual experience elsewhere, and especially with the former history of this mine.

The discovery of this fissure, as related by Capt. Chynoweth, was made in the 2d level; an open space was observed into which a man squeezed his body, and within was found a mass of copper that reached from one level to the other. It is quite possible if the footwall along the conglomerate could be blasted down or otherwise carefully examined, more of these fissures, cracks, or seams might be found. The copper in the main mine made along the footwall, that is in the conglomerate the vein would be sometimes a mere trace, but when copper occurred in considerable quantity the vein widened out to a great width, making its pockets in the conglomerate, which was displaced by the vein matter and copper. Some copper appears in the bottom, and the ground between the 9th and the 10th levels is mainly unbroken, giving a stretch of standing ground in the bottom of the mine of upwards of 700 feet—300 feet to the west and 420 feet to the east of No. 2 shaft.

The water is raised with four 12-inch plungers, 6 feet stroke. No. 6 shaft was sunk nearly to the 9th level in an early day, and afforded a fair amount of copper. This ground was abandoned mainly because it was believed that much better results could be obtained to the east, and it is probable that the great body of ground lying between No. 3 and No. 6 shafts would pay to explore and perhaps to mine. The new shaft in the amygdaloid has reached a depth of 212 feet. At 204 feet down they are now drifting in the belt, and are in 160 feet. The shaft started from the surface at the intersection of the counter or middle vein with the amygdaloid, and gave considerable mass copper while the shaft remained in this line of intersection. The lode in the shaft seemed to hold a width of ten or twelve feet, but in the drift in which they are now working it has a width of only about five feet. It appears to be a good stamp lode, and so far as opened carries considerable copper. An unusually high shaft-house has been built, and the winding drum for operating the shaft is placed in the now compressor building to the south of the shaft.

The work has now reached a point at which stamp mill machinery is required, not extensively yet, but to produce copper the rock must be worked up in a mill. Capt. Parnell inclines to the plan of building a dam to the north across the valley from opposite No. 4 shaft. He estimates the amount of water which he can thus secure as sufficient to manipulate 1,600 tons of rock per month. They could obtain all the water that they formerly had for the old mill, and could add to it the mine water, and could run the water back into the pond, and pump it over as often as it would answer. The location would be very convenient to the mine, and the rock could be run down from the shaft with little cost. But if the mine is to be extensively worked, and should much stamp rock be produced, greater facilities for working it up will be required than this location will afford. The only other alternative is to go to the Ontonagon river. The river is two miles to the west, and 500 feet below the mine; to reach it is a matter of some difficulty, but if the plan of locating a mill there is decided upon the obstacles can, of course, be overcome.

The shaft, No. 2, in the old mine, which has been reöpened and rebuilt, is 7x15 feet, and is furnished with skip-road that will soon be to the bottom. The dip is 54° northerly. The east end of the mine is in the east line of Sec. 16, T. 50, R 39, but a short distance south of the quarter post, and extends westerly nearly to the north and south center line of the section. At this west end of the mine is the line of the Ontonagon & Brulé River R. R. The Norwalk air compressor that has been added during the year has a capacity of ten drills, of which only two were working at the time of my visit. Two new boilers have been added during the year, making four now in use—sufficient for a long time to come. The new compressor building is 35x40 feet. The mining force now employed is 38 men. The total expenditure to date is given at the sum of $75,000.

The following is the company's statement of assets and liabilities:

Assets.

Cash on hand	$3,713 02
1,637 pounds ingot copper on hand at 18c	294 66
Supplies at mine	13,886 68
Due from sundry parties at the mine	2,671 05
	$20,565 41

Liabilities.

Drafts outstanding	$6,172 25
Bills payable	7,500 00
Due for smelting and freight	31 11
" " forfeited stock	235 47
" sundry parties at the mine	4,671 58
Balance assets over liabilities	1,955 00
	$20,565 41

Inventory of property at the mine.

1,851 acres of land, valued at	$6,513 00
Dwelling-houses and buildings	24,500 00
Machinery and mine plant	36,500 00
	$67,513 00

RECEIPTS AND EXPENDITURES FOR THE YEAR 1882.

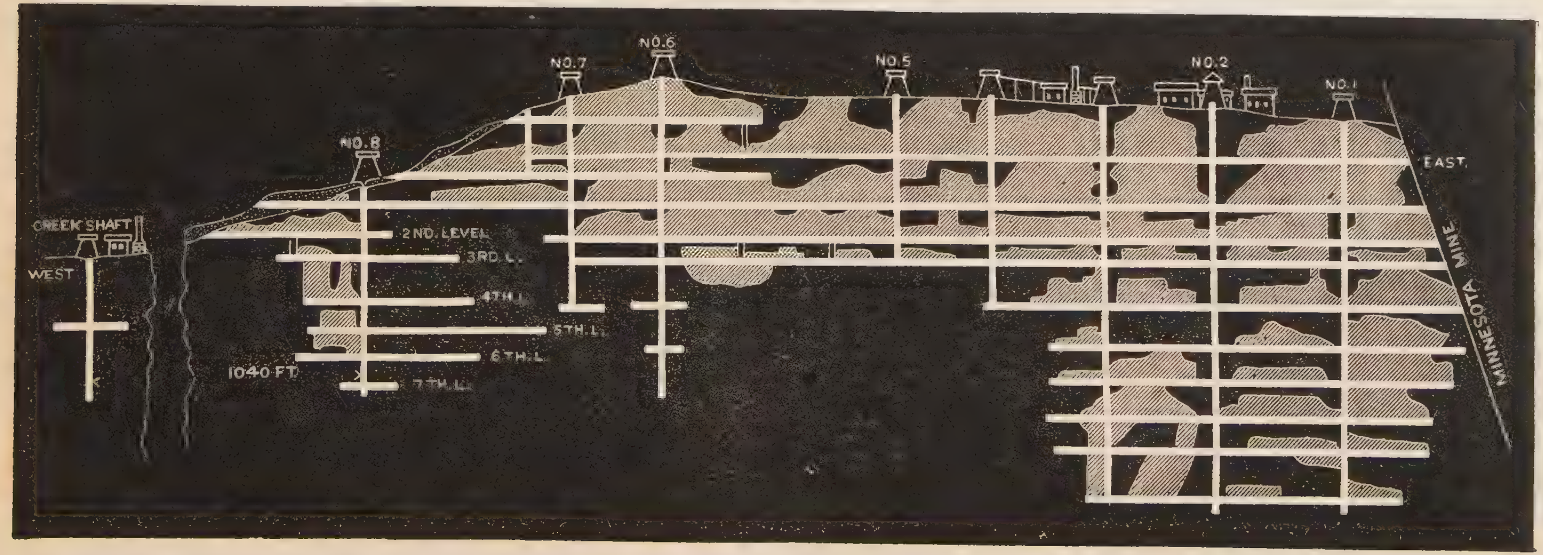
Jan. 1, 1882, cash on hand	$45,782 92
Sales of 15,923 lbs. of copper at 17 323-1000 cents	2,858 23
Received for interest	1,261 06
" from loans	9,500 00
	$59,402 21

Credits.

Cash paid agent's drafts	$51,035 25
" " loan account	2,000 00
Expense, freight, smelting, taxes, insurance, etc.	2,653 94
Cash balance on hand December 31, 1883	3,713 02
	$59,402 21

Product of the National mine of ingot copper:

Years.	Tons.	Lbs.	Years.	Tons.	Lbs.
Previous to 1855	78	1,477	1869	128	947
1855	24	1,302	1870	130	660
1856	88	483	1871	205	1,086
1857	158	957	1872	168	770
1858	132	804	1873	83	1,870
1859	244	176	1874	71	52
1860	539	609	1875	49	878
1861	691	1,760	1876	83	647
1862	432	1,752	1877	34	737
1863	280	1,179	1878	11	736
1864	344	516	1879	8	1,506
1865	348	168	1880	-----	-----
1866	323	1,371	1881	-----	-----
1867	330	922	1882	8	1,650
1868	309	1,820			
Total				5,311	745



LONGITUDINAL SECTION OF THE NATIONAL MINE, JAN., 1883.

Scale, 300 ft. to one inch.

With the exception of the stamp mill the mine is now fully equipped, and the company expresses confidence that with the present rates for copper the mine will be made to pay in the not distant future.

The Boston office is No. 19 Congress street. D. L. Demmon, Secretary and Treasurer; Wm. E. Parnell, Agent, Rockland, Mich.

MINESOTA MINE.

Nothing new has transpired at the Minesota; the mine remains filled with water below the line at which it was drained by the National. The agent informed me at the time of my visit that negotiations were pending for the sale of the mine to parties in Chicago, who contemplated in case of purchase to unwater and work the mine.

Explorations have been continued with the diamond drill in the Peninsula or south bluff in an inaffective way, and in the old mine tributers have worked as usual. The experience which has been had in unwatering the National might well make one hesitate at a similar undertaking in the Minesota; for all the difficulties encountered in the former mine would no doubt be met with in a still greater degree in the latter. It has been attacked by the tributers at every accessible point, and the debris left in the mine dumped into the shafts, which are probably filled to the water level, and yet it is reasonable to suppose that a mine, which yielded so largely in the past, is worthy of a much more thorough exploration than it has received since the copper gave out. No doubt at some time it is destined to receive a further trial.

The mine lies east of the National, and the workings of the two are connected to a considerable depth. Like the National, the main mine was in the south vein, the one underlying the conglomerate, and the general features of the two are identical. Between the conglomerate and the "Calico," or north belt—the amygdaloid—a "middle vein" was discovered as in the National; in fact it was opened and worked prior to the finding of the similar one in the National, and probably stimulated the exploration which led to the discovery of the latter. This middle vein in the Minesota was followed westerly from its intersection with the south vein, and was found to assume a direction in the trap parallel with the other veins. It terminated to the west in a counter vein that crossed the trap belt diagonally from the conglomerate to the amygdaloid, having a northeast direction. This counter vein when opened proved very productive in copper, especially in the vicinity of the line of intersection with the south vein. In this region, both in the counter and in the contact vein, an abundance of copper was found. It was in this line that occurred the great masses for which the Minesota become famous. The 500-ton mass, and a succession of others of nearly equal magnitude were found in the conglomerate along this line. This discovery gave rise to the opinion that was extensively circulated at the time, that the conglomerate itself carried the copper, an assumed fact that had not previously been esteemed as possible. In reality, however, the copper belonged to the vein, and the widened vein extended into the conglomerate. The conglomerate belt was like a wall, that became plastered over with vein matter, and the cracks and holes and cavities in the wall were filled up with vein matter, and in the interstices, as elsewhere in the vein, the copper was contained. It was in the conglomerate, but not of it. The conglomerate itself does not carry any copper, but in this mine and in the National a great deal of copper was obtained in the conglomerate hanging wall of the vein which it overlies. The copper belonged no more to the conglomerate than it belongs to the trap in instances where the trap forms the wall of a vein in which copper is mined, and is found to protrude into it.

The tributers work through the whole mine down to the 3d level. The number of men who now work on tribute in this mine varies from six to twelve, and they are generally able to make good wages. There are in Ontonagon county a class of old miners, who came into the country years ago, and worked in the mines during the palmy days of the mining industry in this county, and have since remained in the county. Having comfortable homes and a good chance to raise vegetables, such as potatoes, etc., and to cut plenty of hay, and use an abundance of pasture for their cows, they were loth to go away, and at such times as they are not engaged in these agricultural avocations they may go to work on their own account in some one of the old, abandoned mines in the vicinity, giving to the owners a certain percentage of the copper which they may obtain. The Minesota, National, and Rockland have been favorite mines for this tribute work, especially the former, because its openings are very extensive, giving a considerable extent of ground through which to work, and because of its location near the village of Rockland, where many of these tribute workers reside.

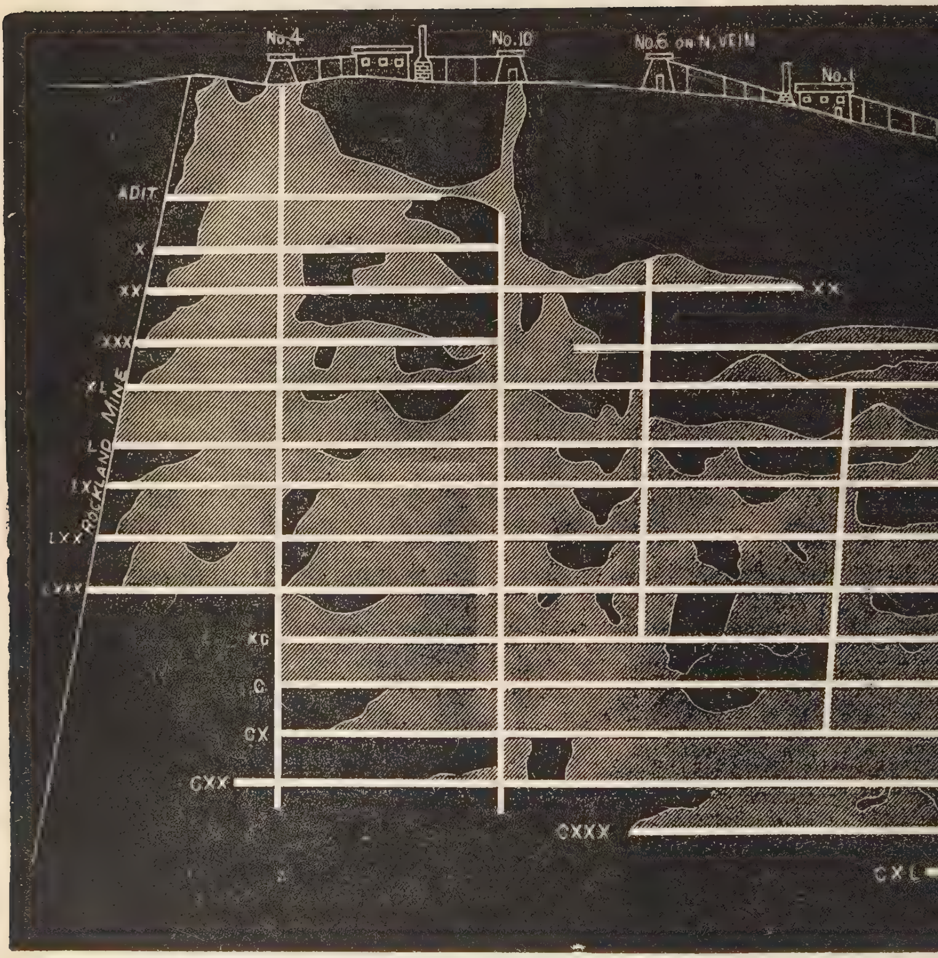
The longitudinal section given in this report shows the mine that is opened on the south or Conglomerate lode. The blank space between No. 10 and No. 4 shafts is that occupied by the middle vein to the north, and which comes into the conglomerate at about the 9th level. A mine was also opened in the amygdaloid 140 feet to the north, and worked down to the 100th fathom level. It afforded stamp rock and some barrel work, but no mass copper, except along the intersection with the counter vein that crossed to the conglomerate. As the stamp mill was a crude affair, the Amygdaloid mine was, compared to the Conglomerate, of but little account. When the masses of copper, in the yield of which the mine had been so prolific, began to fail, the plan of crushing the amygdaloid by the use of rollers was adopted. An expensive plant was procured, and great confidence entertained in the project by Mr. Harris, the agent. The trial was made in 1865, and the experiment proved an entire failure. It was also an expensive undertaking, an unfortunate fact, as it occurred at a time when the finances of the company were at a low ebb. The machinery was not properly designed, and the work sufficiently demonstrated the fact to the satisfaction of the directors that no system of rollers, however devised, was adapted to the reduction of rock containing large pieces of native copper. In connection with this machinery an expensive launder was built, which also proved useless. The mine has not been worked on company account since 1870. At that date the pumps were stopped and the mine allowed to fill with water.

The estate comprises 4,653 acres of land, 500 or 600 acres of which were formerly under cultivation, and produced largely of root crops, hay, pasture, and oats. There are a large number of dwellings and other buildings on the location which were formerly good, but now somewhat neglected and out of repair. The machinery remains in place, with such deterioration as long disuse must occasion. The location of the mine is in Sec. 15, T. 50 N., R. 39, and the extreme length of it is about 2,820 feet. The greatest depth is about 1,200 feet. The bearing is about N. 65° E., and the average dip of the lode is about 54° northwesterly. The collar of No. 4 shaft is estimated to be 650 feet above the Ontonagon river. There is not sufficient water on the location for a stamp mill; certainly not more than enough to run one small Ball head.

The contact vein underlying the conglomerate contains the matrix charac-

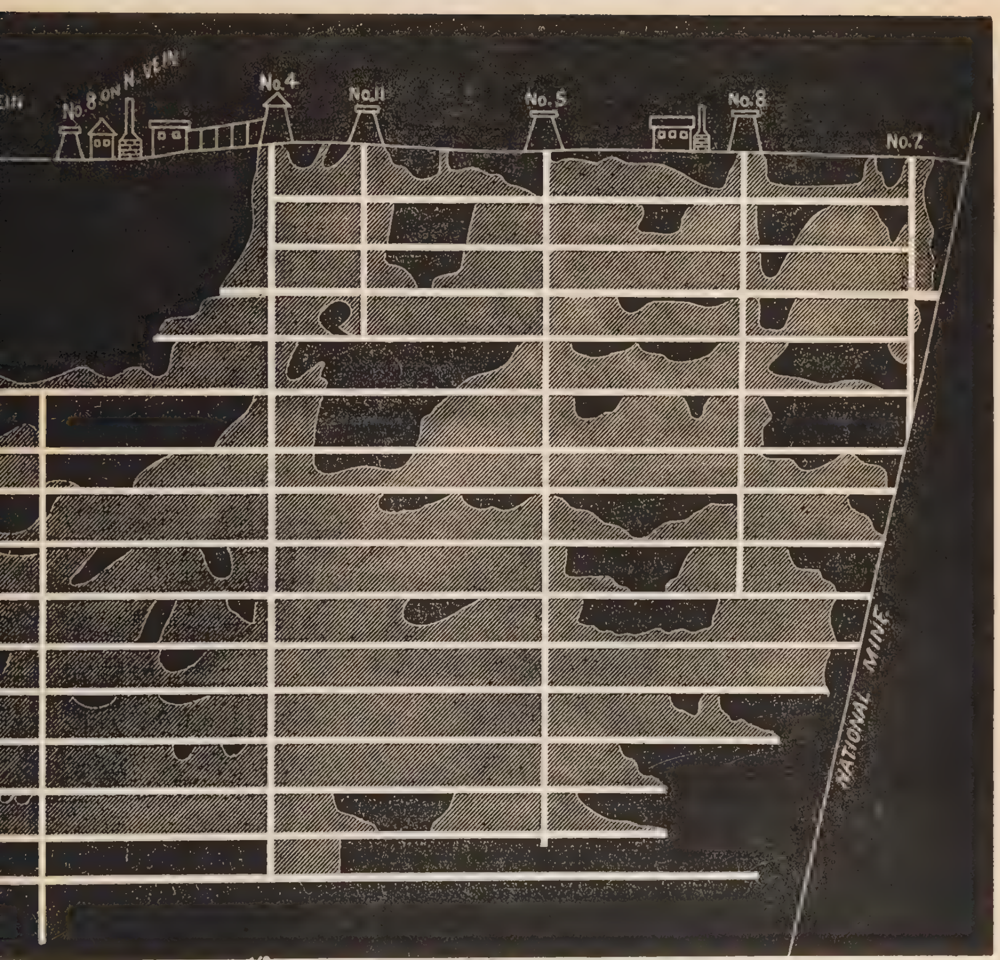
LONGITUDINAL SECT

Scale



THE MINESOTA MINE.

one inch.



teristic of a true vein. The first dividend by the Minesota company was in 1854, and consisted of $90,000. The dividends continued regularly thereafter until 1864; the last one was paid in 1876, and aggregate of dividends paid by the company is $1,920,000.

The following table shows the amount of ingot copper obtained each year in the mine. The first shipment of copper from the mine was made in 1848, and consisted of 6¼ tons from that time to 1855. The total amount sold was 1,510 tons:

Years.	Tons.	Lbs.	Years.	Tons.	Lbs.
Previous to 1855	1,510	-----	1869	113	1,500
1855	1,040	-----	1870	200	1,500
1856	1,745	714	1871	184	-----
1857	1,976	-----	1872	126	-----
1858	1,901	1,914	1873	74	171
1859	1,672	587	1874	93	338
1860	1,340	500	1875	66	1,419
1861	1,508	824	1876	44	954
1862	1,260	-----	1877	56	1,148
1863	838	1,500	1878	87	1,027
1864	723	-----	1879	46	762
1865	201	1,000	1880	16	33
1866	195	1,500	1881	12	227
1867	188	500	1882	5	672
1868	115	900			
Total				1,343	690

Officers are Geo. D. Pond, President, J. Geo. Rippelon, Secretary and Treasurer, New York; Thomas D. James, Agent, Rockland, Mich.

ROCKLAND MINE.

No work, not even tribute work, has been done during the past year at the Rockland mine. Capt. Wm. E. Parnell, agent of the National, has charge of the property, and has sold some of the machinery—two of the hoisting engines —to obtain some money to redeem the property from sale for unpaid taxes. There is a large number of buildings on the location, which were originally very good ones, and the mine was extensively opened and worked. It yielded a good deal of copper in the aggregate, but not enough to cover the expenditures. The company was organized in 1853, and the mine was worked on company account until 1870. The mine adjoins the Minesota on the east, and was originally a part of the Minesota property. The estate comprises 760 acres.

The following table shows the shipments of ingot copper from the Rockland mine:

Years.	Tons.	Lbs.	Years.	Tons.	Lbs.
Years prior to 1855	10	-----	1869	59	1,000
1855	58	-----	1870	47	1,000
1856	146	1,000	1871	30	-----
1857	378	396	1872	25	1,000
1858	311	1,140	1873	11	1,400
1859	239	1,190	1874	22	1,260
1860	344	1,000	1875	5	1,440
1861	388	358	1876	28	1,600
1862	282	-----	1877	19	700
1863	172	-----	1878	8	1,873
1864	260	1,624	1879	-----	1,924
1865	108	1,500	1880	-----	-----
1866	60	-----	1881	-----	-----
1867	35	-----	1882	-----	-----
1868	49	500			
Total product				3,105	309

VICTORIA MINE.

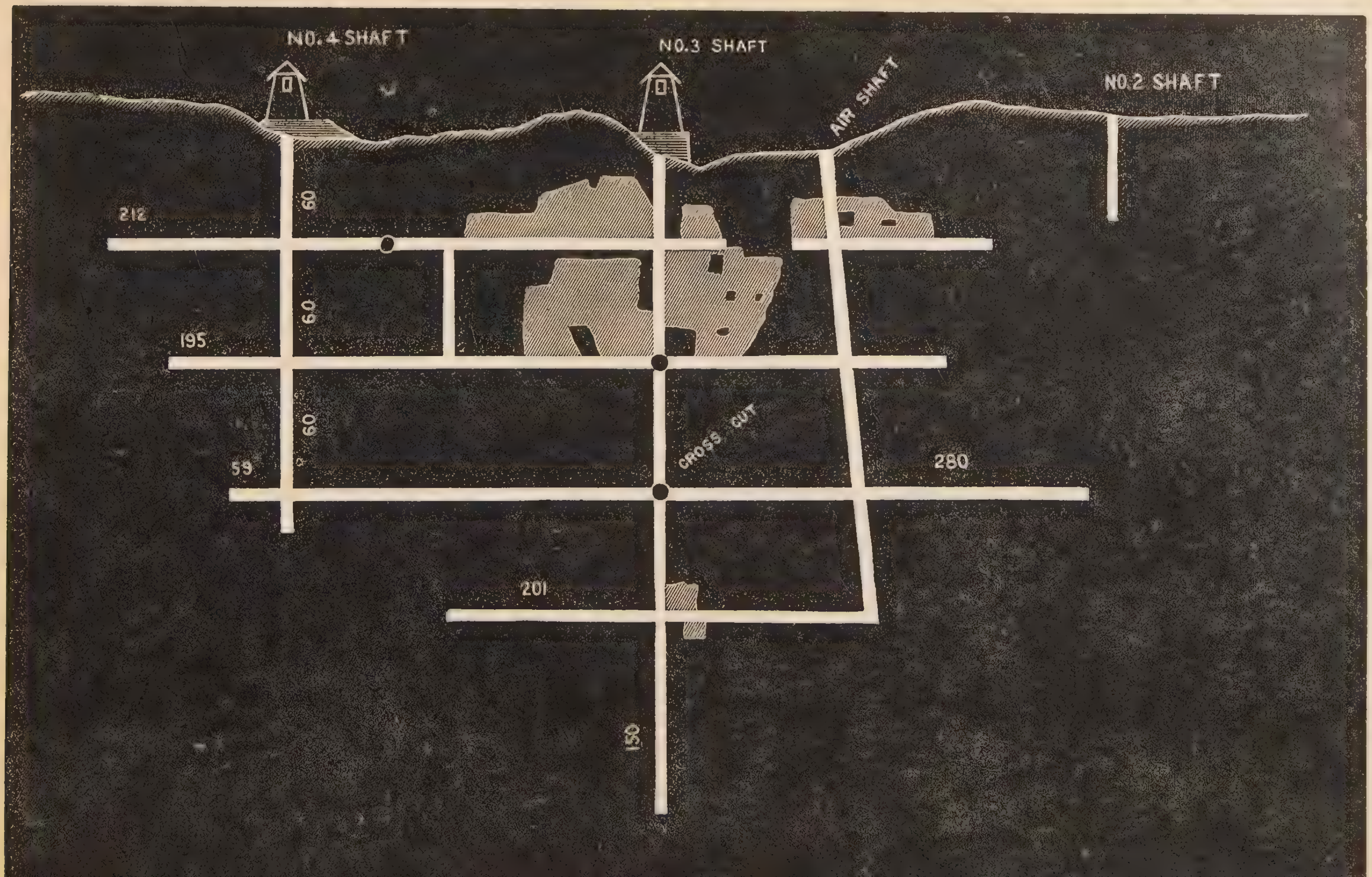
This mine was worked in an early day, and known as the Forest. The company organized originally in 1850, but some work had been done prior to that time, and a mass containing 1,860 pounds had been found in an old Indian pit. It is one of those properties of which marvelous stories are related by credulous miners, who many years ago worked in the mine. They now express great faith in it, and one may hear a good deal of the richness of the mine in the lower levels, and may be readily led to believe, if he gives credence to all that is told to him, that there is a world of metallic richness in the vein awaiting the possessors who shall properly mine for it.

An abandoned mine is very apt to grow in imaginary value with the increase of time. The small masses and deposits of copper seen through the vista of years are marvellously magnified in the mind of the average miner, and he is not unfrequently heard to declare, with great positiveness, respecting some mine that has long remained idle, and which brought only disappointment and disaster to those who formerly worked it, that it is sure to make a paying mine to any who will now undertake it. The Victoria is prominent among the old Ontonagon mines of which this prediction is made, and so much has been said of it by Rockland miners, who ought to know whereof they assert, that Capt. Thomas Hooper, determined to test the truth of these statements, has recently undertaken the task of unwatering the mine. He has secured an option, and will explore it with the view to purchase. Associated with himself are others who share with him the expense. At the time of my visit to the mine, February, 1883, Capt. Hooper was putting the pipe down into the mine, setting the pump—a new Knowles',—fixing the boilers, etc., and expected to be ready to commence raising the water within about one month.

He had built a shaft-house, and was employing a small mining force in the adit level. They had just started a drift to the south in what appeared to be a branch vein that showed some copper. The only part of the mine that could be inspected was along the adit level, which was open for a distance of several hundred feet. The predominating mineral in the lode is epidote, and shows some fine copper. It has been gone over very thoroughly by the tributers, and every piece of copper of a size large enough to be picked out has been gotten

LONGITUDINAL SECTION VICTORIA MINE, JAN., 1883.

Scale, 200 ft. to one inch.



out. The dirt left by the tributers in the mine is mostly good stamp rock, and indicates that if there is enough of it a paying mine should result. It is apparent from the deep holes made in the hanging wall that some good pockets of copper were found to reward the efforts of the tributers. The vein is split up, and in one portion of the adit has been worked in three branches, which are all evidently parts of the same vein, and undoubtedly settled into one at a greater depth. When this point is reached better results should be obtained than in the more broken, unsettled ground. It is claimed by miners who formerly worked in the mine that the vein is pockety, and carries much heavy copper along the foot-wall, but that this fact was not well understood at the time the mine was formerly worked, and hence that the heavy copper has not been taken out. Capt. Hooper proposes to ascertain the verity of these claims. There is considerable machinery at the mine, which may be cheaply put into a working condition. This comprises a large hoisting and pumping engine, two winding drums, two boilers, eight heads of Cornish stamps, and the accompanying washers. This stamp mill machinery was put up about ten years ago with the view of running it, using the mine water. It was only used to a limited extent. Subsequently a large windmill was erected at No. 2 shaft for the purpose of unwatering the mine. The windmill stands there still, but I cannot learn that it was ever of any use.

The mine is on the west side of the Ontonagon river, about three miles southwest from the Minesota mine. It is located in the S. W. ¼ of Sec. 30, T. 51, R. 40. Originally a tram road was built from the mine northeast to the river to a point in the center of section 30, where was a landing to which flat boats were propelled from the harbor, twenty miles, at the mouth of the river. Here also are several houses belonging to the company, and an old stamp mill now well on the way to ruin. The machinery, however, is still in the mill. The line of the tram road was so located as to include a gravity incline to take up the greater portion of the grade.

Among the important advantages which the property possesses is the water-power in the west branch of the Ontonagon river, about a mile south of the mine; forty feet of head can be used here, and very cheaply made available, giving power sufficient for all the purposes of a large mine. To use the water for this purpose would require a race of about 200 feet in length above the point where the wheel would be placed, and about an equal length of tail race; both would be in soft sandstone.

The estate comprises about 2,000 acres of land, and extends to the river. From the high elevation of the mine a fine view may be had of the surrounding country extending to Lake Superior, twelve miles to the west. The vein has been more or less mined for a distance of half a mile, commencing at the east end of the bluff, from which an adit goes in the vein. There are in all eight shafts. The three easterly ones are down to the 3d level, three levels below the adit. No. 2 shaft is down to the 4th level; the others are at various depths, impossible now to determine. The strike is about N. 60° E.; the dip is northwesterly, at an angle of 70°. The character of the lode is similar to the Evergreen vein in the Evergreen Range, and I am inclined to the opinion that they are identical. It strikes and dips with the formation. The other veins of the Evergreen Range must certainly course through the property, as must also the Minesota veins. None of them, however, have been discovered, probably have never been very systematically looked for.

A large boarding house on the location has been repaired, and is now occupied by the mining force. There are a number of other dwellings, but are in a somewhat dilapidated condition The mine is reached by a good highway, through the National, from Rockland. It crosses the river—by ferry in summer and on the ice in winter—at the landing opposite the site of the old stamp mill.

If it shall be decided to systematically work the mine, the water-power in the west branch will undoubtedly be utilized to operate the machinery, and a stamp mill be built on the location, on the broad level space below the mouth of the adit. The person chiefly interested in the ownership of the property is A. W. Coffin, Esq., Boston, Mass.; Thomas Hooper, Agent, Rockland, Mich.

The product of the mine in the past has been:

Years.	Tons.	Pounds.	Years.	Tons.	Pounds.
Years previous to 1855	130	-----	1870	1	1,570
1855	36	-----	1871	1	1,903
1863	3	1,490	1872	-----	1,890
1865	-----	581	1876	-----	752
1866	4	360	1877	-----	861
1868	4	1,820	1878	2	52
Total product				186	1,279

Since writing the above the mine has been freed of water, and from the measurements which have been made the accompanying map is drawn, which shows the underground workings up to the present time.

THE NORWICH MINE.

The Norwich mine, location Sec. 12, T. 49, R. 41, would seem to be one that should invite further exploration, since, considering the amount of work that was done, considerable copper was obtained. The mine is about half a mile north of the Ontonagon river, and eight miles southwest from the Victoria. Work was begun in 1850, and continued on company account until 1858, when it was suspended, and again resumed in 1863, to be continued for two years thereafter. The company called in and expended $230,000 of its capital stock. The estate comprises 320 acres, being that portion of the south half of sections 11 and 12 lying north of the river.

The product of the mine has been as follows:

Years.	Tons.	Pounds.	Years.	Tons.	Pounds.
Years previous to 1855	167	-----	1858	19	1,000
1855	108	-----	1864	4	1,730
1856	110	-----	1865	26	1,330
1857	58	-----	1869	2	1,300
Total product				496	1,360

NONESUCH MINE.

It will be remembered that this property was purchased two years ago, together with Capt. Hooper's lease, and has since been in charge of its new owners. They seem to have delayed sometime in deciding upon a plan of operations. Preparations were at first made for treating the rock extensively with Ball stamps, but some experiments, which were conducted in Chicago and at the smelting works with the rock, led to the adoption of an entirely new plan, wholly different from any heretofore attempted in the copper region for separating the copper from the rock with which it is commingled.

The copper in the Nonesuch belt is mainly in the form of fine particles and scales of native metal, disseminated through the argillaceous, conglomeritic rock, which comprises the belt, and is continued in microscopical fineness in the overlying slate rock. This belt, though variable in richness, as are all copper deposits, carries a good percentage of copper, but mainly in scales so fine and light as to render it a matter of much difficulty to save it; they float away in the current of water which should only carry off the sand.

The company has not done much mining work until recently, but are now pushing the openings to be in readiness to supply the rock for the new works when they go into operation. They have simply mined enough rock in the old stopes to keep the small mill running, and have been otherwise engaged in constructing the buildings and making other surface improvements. The extent of the underground workings is now comprised in four shafts, the east one of which, No. 2, is down 110 feet in depth on the lay, 30° with the horizon. One hundred feet of this distance is in drift, and 10 feet in the lode. They have not been sinking this shaft for some time, but are about to resume work in it. Two hundred and thirty feet west is No. 2 air shaft, which is down to the 4th level, 360 feet below the surface. The shaft is connected in the 2d and 3d levels, and they have also drifted east of the shaft in the 3d level. No. 3 shaft, on the west side of the river, 230 feet from the air shaft, is the deepest in the mine, being sunk to the 5th level, 460 feet from the surface. It is connected with No. 4 shaft, 450 feet further west, in the 1st, 2d, and 3d levels, and the 4th level is extended 200 feet west and 100 feet east from the shaft. Miners are still at work extending this drift, and also sinking the shaft. No. 4 shaft is sunk to 3d level, and is on its way to the 4th. They are also at work extending the 1st, 2d, and 3d levels to the west. The belt in the bottom of No. 3 is looking scarcely as well as in the upper levels. The average width is about five or six feet, one-half of which width is copper bearing in a profitable degree. What percentage can be obtained, however, it is difficult to say. Capt. Hooper when working on tribute was able to save about two per cent of ingot. It is claimed that the average percentage of the belt is much greater.

They are now doing no stoping, only sinking and drifting; in which work they are operating 10 power drills, No. 3 Rand. Two men with one drill drift 50 to 60 feet per month. The new compressor is a duplex Rand, 18-inch air cylinder. The new machinery was built by Hodge, Detroit; two new hoisting drums, 6 feet diameter. The hoisting machinery and compressor are in the same building, with the fitting-up shop overhead, the former being operated by wire rope from the crusher-house. The new hoisting engine is 24 inches by 32 inches, running two drums, one Blake crusher, 9 inches by 15 inches, one Comet crusher, one set of large rollers, and two sets of small ones. The new machinery is not yet fully ready to operate, but the manipulations of the rock when all is in readiness will be somewhat as follows: It will be first passed through the Blake crusher, thence to the Comet crusher, to the large rollers, to the smaller ones in succession. So far the work is undoubtedly a success; this method of pulverizing rock of the character of the Nonesuch vein is the best yet devised.

Up to this point in the work no water is used, but from the rollers the ground material is carried to the Collum washers, which, it is expected, will clean it to 20 per cent copper, and that in so doing the loss will be small. From the jigs the mineral goes into a White's rotary furnace, which is essentially a cylinder, 45 feet in length, receiving at one end and discharging at the other. It is lined with fire brick, and revolves longitudinally, and is set at an angle of about 12° from the horizontal in order to facilitate the discharge. This elevation may be augmented or depressed by means of jack-screws, which are placed for this purpose; also the speed of the rotation of the furnace may be regulated as desired, which, with the pitch given the cylinder, will determine the rate of the discharge, and thus secure the retention of the material in the furnace a sufficient length of time to insure the requisite degree of calcining. From the discharge pit the material is elevated 25 feet—using the common plaster-mill elevator belts and cups,—whence it is run through a pipe into a hot ore bin, which is built of masonry, and has a capacity of 50 tons.

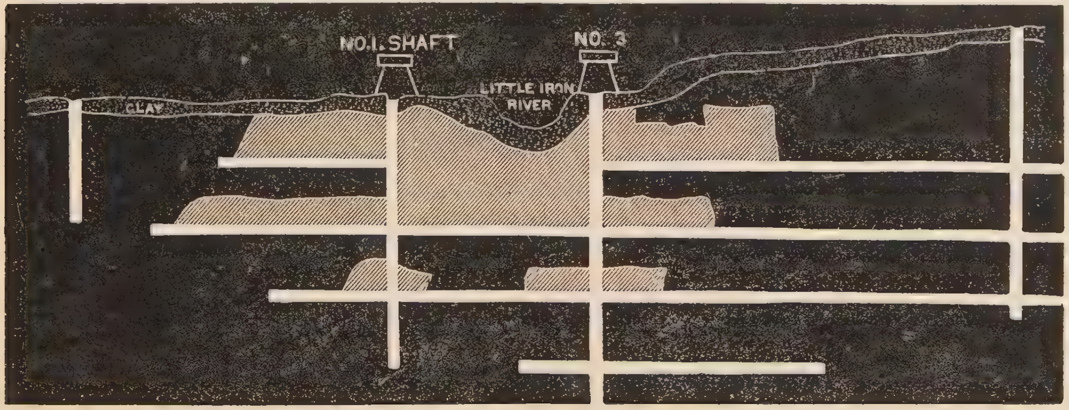
It is intended to raise the mineral to the top of the process house by an incline, running a skip and dumping it at the top into a car, that shall operate on an elevated tram road extending to every part of the building, throughout which are placed tanks or tubs into which the contents of the car are discharged. There are four decks of these tanks, and they hold the solution, which is to act chemically on the mineral. The tanks are filled from the car through a discharge pipe; they have a capacity of 10 or 12 tons of mineral each. The solution is kept at a temperature of 200° Fahrenheit by using steam through copper coil placed in each tub. After lying in this bath the requisite time, the solution, by a leaching process, is passed to the precipitating tanks, where, after undergoing precipitation, the liquor, deprived of its copper, is drained into the reserve tanks, which are placed in the bottom of the building. From these it is pumped back into the upper tubs as required. The bottom of the precipitating tanks are covered with railroad and old scrap iron, to which the copper adheres, from which it is detached and put into barrels. This precipitate, it is claimed, will be 95 per cent pure copper. The works are nearly completed, and it is stated will be in operation about the 1st of April, and will have a capacity of 100 tons of rock per day. If it proves successful the tanks, etc., will be increased in number to the extent of the capacity of the mine to supply the rock. It is claimed that by this method of treating, 5 per cent of ingot copper will be realized from the rock.

The rock-house building is 65 feet by 130 feet. Adjoining this on the west is the boiler house, 50 feet by 55 feet; the latter of stone, with iron roof. The steam will be furnished by five boilers of capacity for all the machinery in the mine. The process and rock-house building is a heavy frame, with iron roof, and the engine house is the same, resting on good stone foundations. The furnace house is 40 feet by 60 feet, with corrugated iron sides and roof. For the present the rock will come from No. 3 shaft, at which is now an old shaft house, and single track trestle to rock and process house; but a new double track trestle has been built to No. 3, and will be extended to No. 4. On this the cars will be transmitted by endless rope.

Timber is now getting out for a new shaft house at No. 4, and for the elevated track to be built to it. Fourteen comfortable log dwelling-houses have been put up by the new company, and several other necessary buildings not before mentioned. The tram road from the mine to the lake is completed, and two miles of the distance has been laid with T rail, 35 pounds to the yard; the remainder of the track is furnished with wooden rail. The supplies for the mine come to the company's dock in Union Bay, where is 16 feet of water at the pier, and thence the supplies are transported by the tram road to the mine. The company employ about 150 men—average force,—and have expended, including purchase, about $400,000.

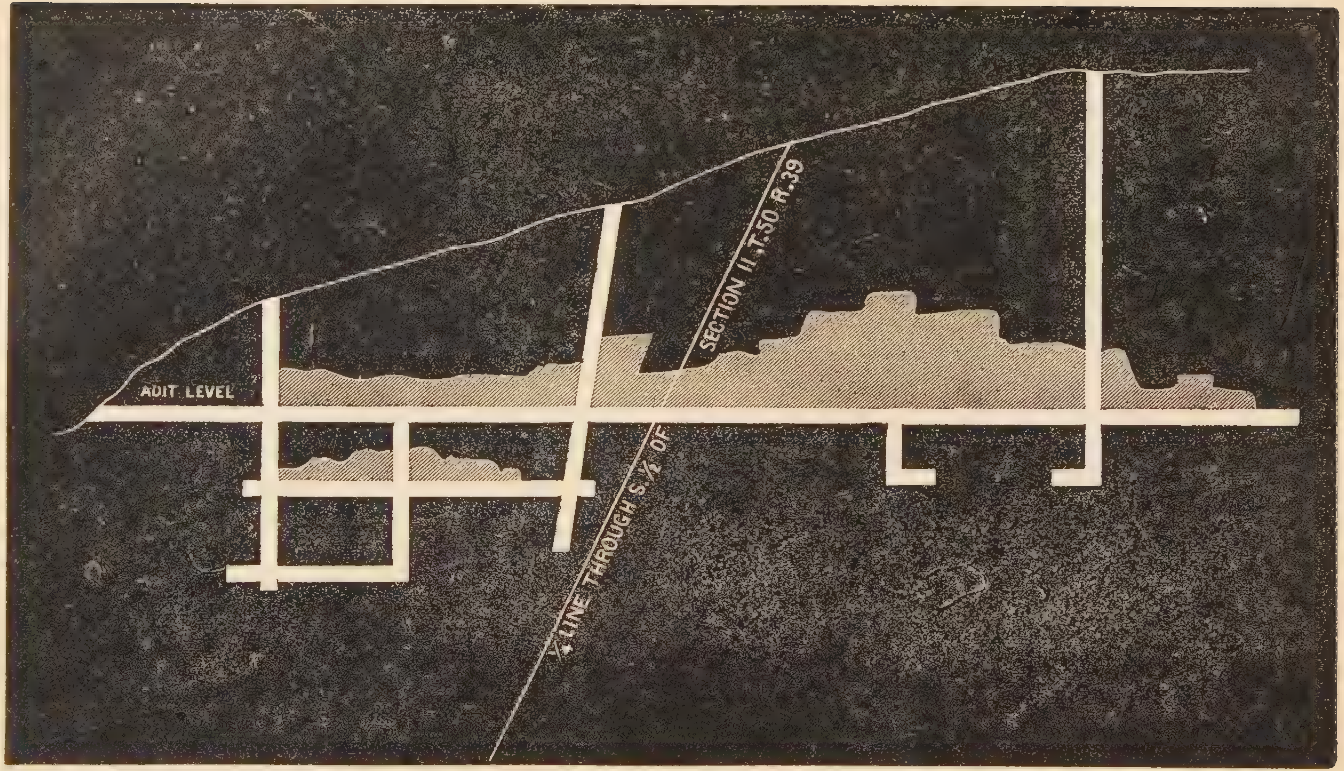
LONGITUDINAL SECTION OF THE NONESUCH MINE, JAN., 1883.

Scale, 200 ft. to one inch.



LONGITUDINAL SECTION FLINT STEEL MINE, JAN., 1883.

Scale, 216 ft. to one inch.



LONGITUDINAL SECTION

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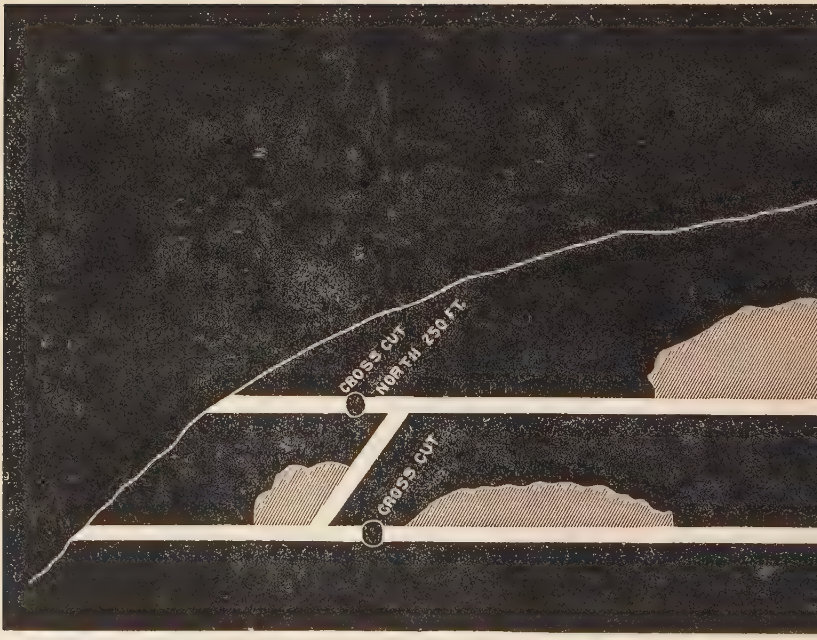
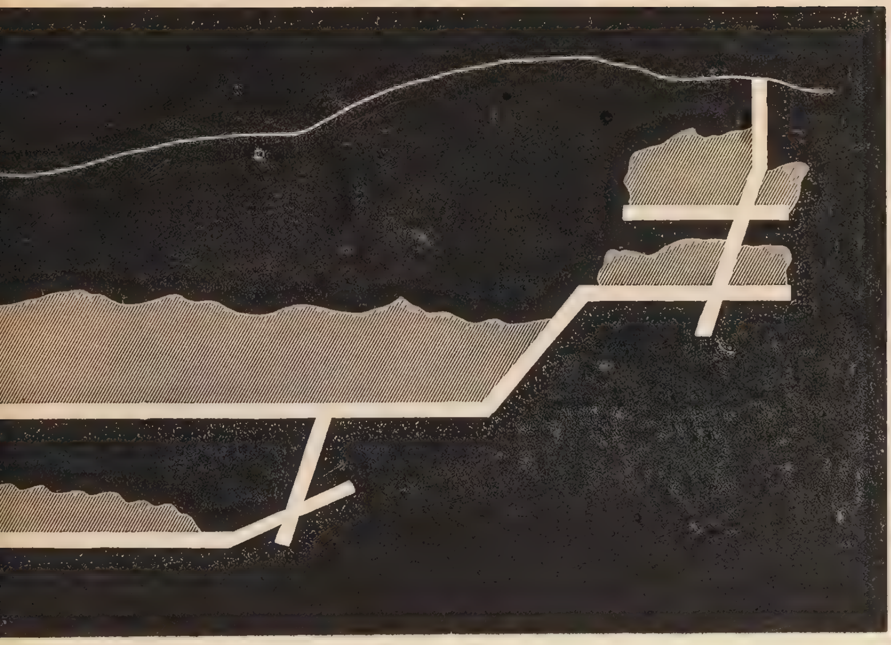


CALEDONIA MINE, JAN., 1883.

one inch.



The stock is divided into 40,000 shares of $25 each. The parties who hold the majority of the stock are operating the mine under Capt. Hooper's lease, which they purchased of him, and which yet has several years to run. The officers are H. L. Horton, Secretary and Treasurer, Chicago, Ill.; S. A. Harrison, General Manager, Milwaukee, Wis.; Wm. Bloodgood, Superintendent; O. C. Hathaway, Mining Captain.

The property is the south ½ of Sec. 1, and the N. ½ of Sec. 12, T. 50 N., R. 43 W., and is in the Porcupine Mountain district, 22 miles from the village of Ontonagon, with which place it is connected by a good highway.

The mine has produced in the past as follows:

Years.	Tons.	Pounds.	Years.	Tons.	Pounds.
1869	1	1,261	1879	15	1,973
1871	-----	257	1880	37	1,584
1874	13	1,450	1881	59	1,061
1875	24	1,667	1882	20	1,607
Total product				178	1,205

THE WHITE PINE.

This is a mineral discovery lying east from the Nonesuch two and a half miles, and in the same lode, that is attracting some attention. The description of the property is the S. ½ of the S. E. ¼ of Sec. 5, T. 50, R. 42. The strike of the vein is about N., 30° E., and the dip southeasterly about 35° to the horizon. Its extent on the property is about one-half of a mile.

Four pits have been sunk to the vein, and a shaft sunk to the depth of 170 feet is still sinking. The vein has a width of about five feet, and is identical with the Nonesuch—a sandstone conglomerate. The owners claim that the rock holds a higher percentage of copper than the Nonesuch rock does. They are able to exhibit very fine specimens. The location is reached by a road from the Nonesuch mine. It is held on a lease by Capt. Thomas Hooper and H. L. Horton. They are awaiting the result of the operations at the Nonesuch before expending a great deal of money themselves. It certainly appears to equal the Nonesuch lode in richness, and would undoubtedly make as good a mine. The Mineral river runs through the property, and would give a fair amount of water for a stamp mill. It is intended to keep the underground work going in a moderate way so as to prove up the lode, and to be in readiness to organize a company, and to commence mining systematically as soon as such a course shall be definitely decided upon. The fee of the property belongs to the St. Mary's Mineral Land Company.

FLINT STEEL COPPER COMPANY.

There are three mines on this property that have been worked in days gone by. The present organization is a union of the old Caledonia and Flint Steel companies. The Caledonia mine lies up on the high precipitous bluff which forms the north side of the gap made through the range by the Flint Steel river. This portion of the property comprises the N. E. ¼ and the N. W. ¼, except 30 acres of Sec. 12—T. 50, R. 39—on the south side of the gap, the former Flint Steel mines on the S. W. ¼ and W. ½ S. E. ¼ Sec. 12, and S. E. ¼ of Sec. 11, T. 50, R. 39. The stamp mill, which at the time it was made, was a good one, and has been but little used, is on the Flint Steel river, in the N. W.

¼ of Sec. 12, and was reached from both sides of the gap by long trestles, which are now tumbling to ruin. Sections of two of the principal openings formerly made on this property are shown in the accompanying plates, besides which another was made with three shafts to the 2d level. The property is offered for $100,000. Walter Furguson, Secretary and Treasurer, 35 Pine street, New York, N. Y.

The product of the two mines for past years is as follows:

Years.	Tons.	Pounds.	Years.	Tons.	Pounds.
Previous to 1855	4	651	1870	17	259
1855	29	-----	1871	46	500
1856	2	1,500	1872	22	1,874
1858	1	106	1873	38	698
1859	7	1,000	1874	24	772
1860	20	400	1875	16	1,054
1863	3	1,730	1876	15	115
1864	15	1,970	1877	13	67
1865	108	959	1878	19	356
1866	50	1,000	1879	21	1,192
1868	13	243	1880	14	80
1869	52	1,853	1881	2	140
1870	43	1,508	1882	-----	-----
Total product				604	46

KNOWLTON MINE.

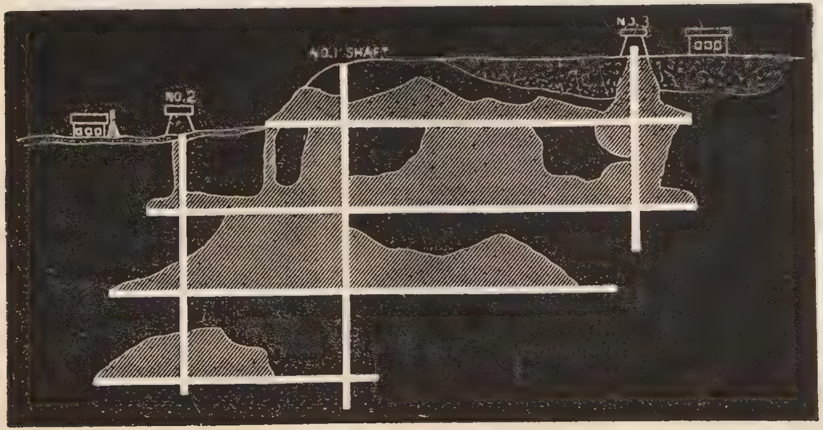
Adjoining the Caledonia, and between it and the Mass is the Knowlton mine, comprising the S. ½ and W. ¾ of the N. W. ¼ of Sec. 1, and the E. ½ of the E. ½ of Sec. 2, and the N. ½ of the N. E. ¼ of the N. W. ¼ of Sec. 12, T. 50, R. 39, 550 acres in all. The surface of the location is exceedingly rough and broken, particularly in that portion of it in which the mine is situated, affording no very good ground for building sites. Below the bluff, in the bottom of the gap, courses the Flint Steel river, which near the west side of the property has sufficient volume for a stamp mill of considerable capacity. The Knowlton vein, which has now an established reputation for productiveness in the Evergreen range, cuts across the southeast corner, giving a surface length of about 400 feet, but dipping to the northwest, and so lengthening out as it goes down. The Mass and the Butler veins also cross this corner of the property to the southeast, and are of course much shorter, the latter being not more than 100 feet, surface length. To the west the land is in the valley of the Flint Steel.

A proposition has been entertained for consolidation with the Mass, but not on such terms as the latter would accept, since the Knowlton company esteemed its property as equal in value to the Mass, which is scarcely equable. They ought to be together in order that the Mass might have advantage of the water which is found on the Knowlton.

The mine for many years has been filled with water to the adit level, and in the small stretch of ground opened above that point the tributers have from time to time found considerable copper along the foot wall. The heavy copper in the Knowlton lode makes in the foot wall. Capt. Dunn, with four miners, is now working above the adit, and is meeting with very good success. They expect to get out ten tons of copper this winter. At the time of my visit they had just found a 3,000 pound mass, and had mined in all about five tons. They can

LONGITUDINAL SECTION OF THE KNOWLTON MINE,
JAN., 1882.

Scale, 180 ft. to one inch.



only use mass and barrel work, as they have no facilities for stamping. They give the company 3-16 of the ingot obtained, delivered in Detroit. Capt. Dunn finds it is worth to him 9 cents per pound in the mineral, that is before smelting. Capt. Thomas T. Dunn has charge of the property. F. W. Capin, Secretary and Treasurer, New York, N. Y.

The following is the product of the mine in the past:

Years.	Tons.	Pounds.	Years.	Tons.	Pounds.
1862	11	439	1873	35	442
1863	42	1,451	1874	3	215
1865	98	724	1875	3	562
1869	53	977	1877	2	1,975
1872	8	1,559	1878	4	629
Total product				263	973

MASS MINE.

The Mass mine, small as it is, is the most important mine in Ontonagon county. It pays the best, is the most economically and systematically worked, and by its product and other results does more to keep up the credit of this mining district than any other mine in it. It is true the mine does not pay any dividends to its stockholders, but neither does it call upon them for assessments. It makes a surplus each year, which is used to further equip the mine, securing additional machinery and extending the openings. The Mass is simply one of a large number of mines in what is known as the Evergreen range, and its success demonstrates the productiveness of at least one of the lodes, which are known to traverse the range, and suggests what, with equal good management, other of these now idle mines might achieve. This latter part, however, would be no easy matter to accomplish, for it cannot reasonably be expected to readily secure the services of so accomplished and efficient a mining superintendent as Capt. Chynoweth. A lifelong experience as a miner, twenty-five years of which has been spent in this vicinity in the National mine, united with excellent natural abilities, habits of study and observation, have thoroughly acquainted him with every detail, practical and theoretical, of mining work, and an entire familiarity with all the features of the mineral deposits of the copper district. That he should undertake the superintendence of a mine is in itself a guarantee of success, and the truth of such an inference is verified in the recent history of the Mass.

Work at the Mass was begun in 1856, and continued moderately until 1860, when it was suspended, to be resumed again four years after, and further prosecuted until 1868, when it was entirely discontinued, and the mine remained idle until 1874. At this date it was decided to undertake for the third time to work the mine, and Capt. John Chynoweth accepted the charge of the work. As there were no funds, and very little of underground openings, surface improvement, machinery, or other mining plant to begin with, a moderate assessment of $1.00 per share was made, by which the sum of $14,195 was realized. With this moderate fund the beginning was made, and was so judiciously expended, and the subsequent work so carefully conducted, that the mine has since been self-supporting, and has supplied all the money that has been spent in running it and making the improvements; no assessment has since been made.

The estate consists of 760 acres, being the S. W. ¼ Sec. 6, and the N. W, ¼ of

Sec. 7 and Hazard Mine property, the S. E. fractional quarter Sec. 1, and the E. ½ of the E. ½ of the N. W. ¼ of Sec. 1, T. 50, R. 39, and the N. E. ¼ and the N. ½ S. E. ¼ Sec. 35, T. 50, R. 38. The trend of the formation is about N. 40° E., and the copper bearing belts correspond with it in direction and in dip. The metalliferous belts which cross the Mass property are found, so far as is known, in the S. W. ¼ of Sec. 6, passing diagonally through the northwest corner of the above mentioned quarter section. On the north the veins pass to the Ogima, and on the west to the Knowlton. Several of the veins have been worked in the past to a limited extent, but the present mine is in the Knowlton vein, which is the most northwesterly, and consequently the shortest one. The surface length of this vein on the property is about 920 feet, and as it dips northwesterly, at an angle of about 47°, it is continually shortening with increased depth. The distance from the vein to the corner, measured at right angles, is 450 feet northwesterly, so that the Knowlton lode on the Mass property is in form of a triangle, having a length of base of 920 feet, and an altitude of about 662 feet. However, the mine as thus far worked out is but a small portion of the lode which the property holds. The mine is in the center of the length of the vein, about midway between the north and the west lines. In mining the hanging wall is followed; it is a hard, dark colored trap, easily distinguished—Country rock it is called. The lode itself is a pretty hard amygdaloid, having considerable trap, but in places, where the copper is chiefly found, is characterized by the occurrence of vein minerals—spar, epidote, prehnite, etc. In places it is narrow, and in others spreads out to great width. Sometimes the conditions are favorable—"the vein looks healthy," as the miners say—but no copper is found. The line of demarkation between the foot wall and the vein is not easily determined; the vein makes into the foot in pockets in which the heavy copper is found. They are guided by the hanging and work in the opposite direction so long as vein matter or copper is found. The whole formation is faulted; a length of 400 feet is thrown to the north 25 feet, and is besides a good deal contorted and twisted. Originally the first openings were made in the Mass vein, so named, which is 120 feet south from the Knowlton, the one now worked. Only one shaft was sunk in it, and work was transferred to the Champion or Butler vein, which is 290 feet southeast of the Mass vein. It is a broad, segregated belt of trap and vein matter, with isolated masses of copper occurring. Ninety feet further is the Ogima lode, so called, as it is the one opened on the Ogima location. From this latter it is 260 feet to the Evergreen vein, the one mined in the Evergreen Bluff and the Ridge mines. Of the Evergreen lode there is half a mile of surface length on the quarter section, and five short shafts were once opened in it near the north line, but it did not prove as productive as it was then doing at the Evergreen Bluff mine, and work was not prosecuted in it to any great extent. Subsequently to test these several veins the very sensible plan was adopted of starting a cross-cut in the west side of the bluff and driving it to the east across the formation. This tunnel is 1,400 feet in length through the bluff, and is the most systematic and valuable exploration ever made in the Evergreen range. It is the only point at which the relative distances of the lodes have been accurately measured, and the features of the different belts studied and noted. The north lode—the Knowlton—was reached at 180 feet from the mouth of the adit, northwest end of it, and the exploration which was made in it resulted so favorably that a shaft was sunk in the vein from the surface, and the most of the mining work has since been continued in this lode. At the point where the tunnel intersected the vein a cross-course was also met with, and the tunnel through the bluff was made to follow this slide for about two-thirds of the distance, when it was lost, and the remainder of the driving was in trap, at a greatly increased cost.

The cross-courses in Ontonagon county are seams filled with clayey or soft material crossing the formation; they are barren of copper in all instances. Along this tunnel the faulting in the formation was first observed. The five distinct veins that were encountered in the tunnel are irregular in course and dip, but correspond in these respects with the general trap formation; their width varies from five feet to thirty feet and upwards, it being frequently difficult to determine the exact limits from the close similarity between the vein rock and the inclosing trap.

The mine openings are mainly northeast of the tunnel, and recently as the levels reached a distance of 700 feet in that direction another large cross-course or transverse fissure vein was encountered, and the further discovery made that at this point the formation is faulted. In fact the whole body between these two slides, the one in which the tunnel is driven and this one recently met with at the northeast, is thrown to the north a distance of 25 feet. Beyond this the main vein again assumes its normal position, and preserves its mineral characteristics. The two offsets in the lode are conformable to a straight line beyond the intersections with the cross-course.

This displacement has delayed the work of sinking a shaft, a matter which it had been determined to accomplish, by reason of the uncertainty of the location of the vein. All doubt, however, has since been settled, and the company is now prepared to complete this necessary work, and ere the close of another year it is expected that this second shaft will be in full operation, and greatly add to the output of the mine. The history of this mine shows a very conservative policy in its management; it was tested on a small scale and found to be able to sustain itself, and as the operations reached a greater magnitude the degree of success was correspondingly increased. The mine is now in shape to make an output of rock greatly in excess of what it has heretofore been possible to accomplish. A new hoisting engine has been added, and several air drills within the past year. The mine is now equipped with a duplex air compressor, twelve power drills, and the new hoisting engine of a capacity which must suffice for many years to come.

The power drills were added upwards of a year ago, and the result has been that the amount of rock that was mined during the year was one hundred and four per cent in excess of that which was obtained the previous year, and the product of mineral was increased seventy per cent, while the increased per cent of expenditure was less than twenty. But to further enlarge the operations is rendered impracticable with the present stamping facilities. The present mill has a capacity of about 50 tons per day, unequal even now to the capacity of the mine, and when another shaft shall be in operation the mine may easily produce 100 tons of stamp rock per day. All this could be readily met if there were sufficient water, but there is scarcely more than enough for what is now manipulated, and either the present volume must be utilized in a more effective way than is now done, or a new site affording a greater amount of water must be chosen. The most feasible way apparent, to increase the stamping power on the present site, is to build a series of dams along the creek in which to hold the water, so that none should escape without first doing duty in the mill. The question of fuel also enters into the problem, as the company's timber in the vicinity is nearly exhausted, and additional wood-lands must be obtained.

The project is entertained, if suitable arrangements can be made, of building a stamp-mill further down the stream, on the main branch of the Flint Steel, near the west line of the Knowlton property. A sufficient quantity of water is found at this point to probably suffice for all the future wants of the mine. It could be reached from the foot of the present incline with a tram road, or railroad operated with a small locomotive.

The following is a synopsis of the results of the leading features of the year's work:

	Tons.	Pounds.
Total amount of rock mined	41,000	
" " " hoisted to the surface	40,000	
" " selected for stamping	15,472	
Percentage of shipping mineral in stamp rock	1.50	
" " " rock hoisted, including mass and barrel work	1.28	
Percentage of refined copper in the whole amount hoisted	.90	
" " " to mineral	70.658	
The product consisted of 256 masses of rough mineral weighed	100	298
Three hundred and seventy-seven barrels of rough mineral	194	1,360
Three hundred and thirty-eight " stamp "	231	1,830
Total product of shipping mineral	526	1,488
" " refined copper	372	331

The following summary shows the amount of underground work which was done, together with the cost and other facts connected with the year's work:

Sinking 25 feet,	@ $16 10,	$402 57
Drifting 278.3 feet,	@ 12 41,	3,454 08
Stoping 2,278 cubic fathoms,	@ 11 37,	25,916 51
Cutting copper		764 28
Overseeing and sundry work underground		3,644 54

A few fathoms of vein have been stoped in the Mass vein, the expenses of which were charged in the general account.

The present extent of openings in the Knowlton vein is as follows:

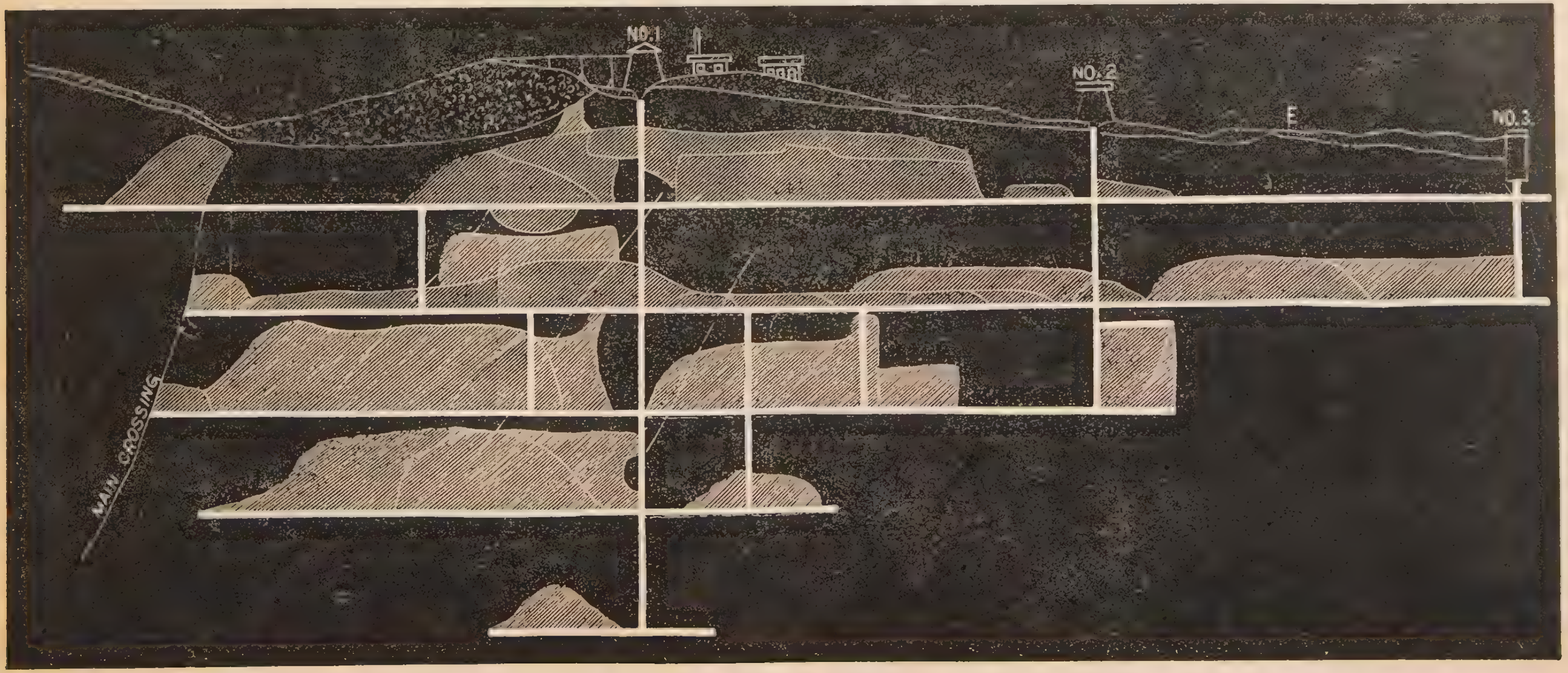
	Feet.
First level	765
Second "	740
Third "	608
Fourth "	292
Fifth "	141
No. 1 shaft, depth	518
" 2 " "	184

The expenses for the year are shown in the following statements:

Fifty-three and one-third miners, timbermen, and others	$24,119 78
Sixty-six mechanics, laborers, and others,	30,407 85
Supplies, including powder, candles, etc.	17,689 17
Machinery purchased	4,913 50
Four thousand one hundred and sixty-two cords wood consumed	9,933 00
All other expenses, including taxes, wood, stumpage, salaries, etc.	12,664 24
Total	$99,727 54

LONGITUDINAL SECTION OF THE MASS MINE, JAN., 1883,

Scale, 120 feet to one inch.



The work for the past has been confined, as before stated, to the Knowlton vein, but it is the intention of the company during the coming year to commence work in the Mass and in the Champion veins.

The amount of mineral produced each month of the company's fiscal year is as follows:

	Pounds.
November, 1881	63,883
December, 1881	74,125
January, 1882	77,945
February, 1882	77,214
March, 1882	73,049
April, 1882	56,745
May, 1882	79,830
June, 1882	80,389
July, 1882	86,932
August, 1882	104,230
September, 1882	114,151
October, 1882	164,995
Total for the year	1,053,488

It will be seen that the monthly product varies considerably. This is due largely to the bunchy character of the vein; possibly also some large masses at which they have been sometime at work may be gotten out one month and so count in that month's product, but generally such are not the actual result of any one month's work, nor is the product of any particular month a criterion for a whole year's business, but the general average for the same amount of vein removed will be about the same. The small product for the month of April is mainly due to the fact that the stamp mill was idle during a part of that month.

TREASURER'S REPORT OF RECEIPTS AND EXPENDITURES TO DECEMBER 1st, 1882.

Receipts.

Assessments paid in		$149,202 00
Sales of copper to date of last report	$363,427 01	
Sales of copper since date of last report	106,327 08	
		469,754 09
Due sundry parties		16,503 46
		$635,459 55

Disbursements.

General expenditures to date of last report	$520,063 90
Taxes	494 31
Freight	3,052 22
Insurance	818 15
Smelting	6,835 51
Expense	1,442 00
Interest	1,596 37
Labor drafts paid	101,140 84
Due by sundry parties	16 25
	$635,459 55

Liabilities.

Labor drafts outstanding	$4,487 11
Debts due	16,503 46
	$20,990 57

Cash Assets.

289,406 pounds mineral estimated value	$34,500 00

The Mass mine has passed the experimental stage, it need no longer be a matter of uncertainty as to the profit of working it. It produces copper enough to the fathom of ground to pay well. What is needed is extended opening and increased stamping facilities. It is perfectly evident that with the mine three or four times as big as it is now, with the same relative productiveness and economy of working, the Mass would be a first-class dividend paying mine. It should own both the Ogima and the Knowlton lands. The former on the north and the latter on the west, this would give all the length of vein that need be desired, and also good stamp-mill site, with sufficient water. The mine could then be opened to any length on any and all of the veins. Few mining combinations could be made that would promise better than this.

While the Mass is doing much to preserve the mining credit of Ontonagon county, and especially of the Evergreen range, it is working against its own interest if the purchase of the adjacent properties before mentioned is contemplated. While demonstrating its own merit it is enhancing in an equal degree the value of the same lodes on its neighbor's property, and thus making the matter of purchase all the while more difficult. The Ogima and Knowlton companies are doing nothing, their properties are in a good measure being proved by the work at the Mass.

The officers of the company are Dr. C. G. Hussey, President; Jas. W. Brown, Secretary and Treasurer. Office, No. 47 Fifth avenue, Pittsburg, Pa. Capt. John Chynoweth, Superintendent, Greenland, Mich.

The following table shows the product of the Mass mine of refined copper:

Years.	Tons.	Pounds.	Years.	Tons.	Pounds.
1857	8	228	1872	---	1,903
1858	6	----	1873	4	265
1859	26	682	1874	5	1,925
1864	4	1,452	1875	1	1,014
1865	6	936	1876	40	1,952
1866	5	112	1877	54	238
1867	5	40	1878	206	339
1868	9	939	1879	228	294
1869	1	1,213	1880	258	1,159
1870	1	1,408	1881	233	1,684
1871	9	692	1882	368	1,446
Total product, refined copper				1,486	1,825

OGIMA MINING COMPANY.

The Ogima property adjoins the Mass on the north. The description is the N. W. fractional quarter, Sec. 6, T. 50, R. 38. The company also owns in addition the N. W. ¼ and the N. ½ of the S. W. ¼ of Sec. 33, T. 50, R. 38. The mine is in the first named property. The north vein, the Knowlton, crosses the quarter section southeast of the center of it, and as it dips to the northwest there is perhaps as much of the Evergreen range lodes underlying the surface of this property as it is possible to contain in this extent of territory. The mine that was opened and worked was in the Ogima vein, the one which lies between the Champion and the Evergreen veins. The underground work was limited to three shafts, two to the 4th level, about 300 feet below the surface, and connected at all the levels, and the other shaft was only sunk to the adit level.

The company was formed in 1860, previous to which time the surface on the several veins had been worked and considerable copper found by miners exploring on their own account, guided in their search by the ancient Indian diggings. The company worked the mine eight years, or till 1868, when they permanently suspended mining operations. Since then tributers have worked more or less above the adit level, obtaining each year a small amount of copper. Assessments were made to the amount of $140,000, which, with the money obtained from sales of copper, was expended in surface improvements. A stamp-mill was built—still standing—with 8 heads of Gates stamps; it is located upon the bluff at a considerable hight above the water. There is not water enough to run a stamp-mill, however small. It is a good property to be worked with the Mass, but is not a suitable location for an independent mine, as there is, practically, no water.

The office of the company is No. 7 Pine street, New York. Samuel Cooper, Secretary and Treasurer; L. Collins, Agent, Greenland, Mich.

The product of the mine in refined copper is as follows. Previous to 1860 there had been taken out and sold of tribute copper 57 tons 1,000 pounds:

Years.	Tons.	Lbs.
Previous to 1860	57	1,000
1861	7	-----
1862	20	600
1863	26	1,530
1864	25	-----
1865	70	990
1866	138	1,310
1867	84	480
1868	99	1,360
1869	9	45
1870	4	1,839
1871	1	800
1878	---	-----
1879	8	1,937
1880	2	1,885
1881	8	776
1882	2	207
Total product	496	1,360

MERRIMAC MINING COMPANY.

Joseph G. Henzey, President. Office 110 Front street, Philadelphia.

This location joins the Ogima on the north, being the E. ½ Sec. 34, and the S. ½ S. E. ¼ of Sec. 27, T. 51 N., R. 38, consisting of 400 acres.

The company was organized in 1863, and the sum of $117,000 collected by assessment, and expended mainly in surface improvement—houses, etc. Very little mining work was done, and no copper produced. The veins which cross the Ogima on the south do not out-crop on the Merrimac, but underlie the surface, and the attempt was made to reach the Knowlton vein by sinking a shaft to it, but it was discontinued before the lode was intercepted. There is no water for stamp-mill, at least not enough to be of any practical avail. The buildings—dwellings—are occupied by miners working elsewhere. The property is for sale.

EVERGREEN BLUFF MINING COMPANY.

This company owns section 8, N. E. ¼ Sec. 7, E. ½ Sec. 6, S. W. ¼ and S. ½ of the N. W. ¼ Sec. 5, T. 50, R. 38. The mining work was done in the N. E. ¼ Sec. 6, in the southeast vein, since called the Evergreen Bluff vein. It is the only one of the five well known lodes of this range that has much length on the Evergreen Bluff mine property. Its surface extent is about 3,000 feet, entering the property a little north of the center of the section, and running northeast it crosses the section line near the eighth post. The other workable lodes being situated to the northwest, and dipping also in that direction, either do not extend through the property, or if at all to so limited an extent as to be of little value to the owners of this land. An exception might be made of the Ogima vein, the one nearest to the Evergreen Bluff.

The underground work developed a very irregular lode, as seen in this mine and in the Ridge, where it is also worked, it is one of the most singular deposits with respect to the irregularities of the formation to be found anywhere in the copper range. It varies from narrow to a great width, partaking of the appearance of an irregular seam or crack in the formation, which was subsequently filled up with trap boulders and vein matter. The copper is found in isolated masses and bunches of barrel and stamp work.

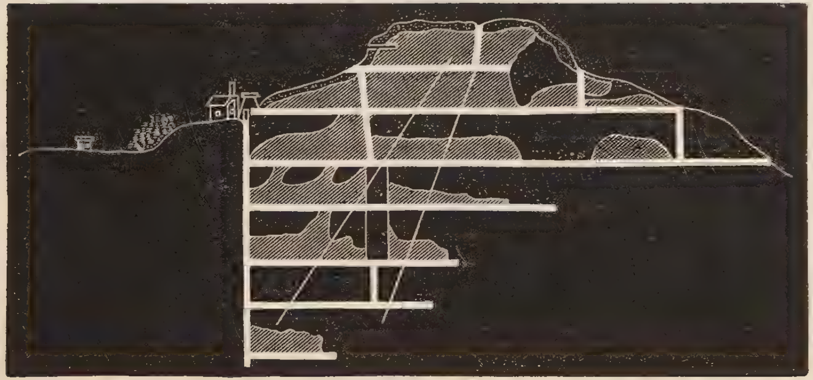
The company was originally organized in 1853, and for a few years a small force was worked. In 1863 a new board of directors assumed control, and the operations were somewhat enlarged, the mining force was increased, the stamp-mill renovated, many houses built for the miners, etc. Work was thus continued until 1870, when the company suspended operations. The only mining work that has since been done was by tributers. Since 1878 Mr. L. Collins has had charge of the property, and he resides on the location. The small branch of the Flint Steel river crosses the property, and on this the mill is located. It is the same stream on which are also situated the Ridge and the Mass mine stamps, and, as with them, affords an insufficiency of water. The following table of product shows that the mine, considering the limited way in which it was worked, afforded a fair amount of copper, sufficient to indicate that with greater economy, skill, and vigor it could have been made to pay. The company, however, found that their expenses all the while exceeded the income from the sales of copper, and concluded they had tried it long enough to satisfy themselves that they were not likely to turn the scales the other way, and so quit, as it has proved, permanently.

The company's office is 44 Exchange Place, New York. F. W. Capen, Secretary and Treasurer.

Years.	Tons.	Pounds.	Years.	Tons.	Pounds.
Previous to 1855	1	549	1865	187	1,213
1855	7	100	1869	73	1,662
1856	12	1,110	1870	55	1,420
1857	23	942	1871	22	1,048
1858	3	665	1878	35	1,873
1859	19	811	1879	15	405
1860	31	1,817	1880	5	651
1861	49	1,187	1881	---	968
1862	59	1,257	1882	---	----
1863	70	1,446			
Total product refined copper				675	1,174

LONGITUDINAL SECTION OF THE EVERGREEN BLUFF MINE,
ONTONAGON COUNTY, MICH., 1882.

Scale, 250 ft. to one inch.



RIDGE COPPER COMPANY.

Until recently, for many years, the Ridge has been the leading mine in the Evergreen range, but since the Mass has advanced to that position, the Ridge has, nevertheless, held a favorable position in the estimation of the mining public. It has been rightly considered that with a more liberal management the mine would have made a very favorable showing. The machinery is wholly inadequate, is old and worn out, and should have been displaced by more modern and efficient machinery years ago. The mine has long required a new hoisting engine and drums, a compressor and air drills, new and more effective stamping and washing machinery, and thence a more vigorous prosecution of mining work. But the company has run the mine in a seemingly puttering, ineffective way, until the point is reached when they have felt constrained to practically suspend operations.

There are two mines on the property, both of which are shown in the accompanying plates. The mine in the Champion vein has long been idle, and it is now proposed by Agent Harris to unwater and re-examine it. After the mine in the Evergreen vein was opened the other was abandoned, and has since remained filled with water. The ground plan of this old mine, in the Champion or Butler vein, shows that the levels were scarcely worked out to the full width of the vein. The workings, as shown on the map, would seem to be so narrow that along the foot or hanging must still remain a portion of the vein rock. The section, it will be seen, exhibits the fact that only a portion of the ground that was opened was stoped away, so that it may be estimated that not only those blocks remain, but also a further amount between the drifts and the walls. This vein is probably from 5 feet to 15 feet wide, and it would appear that at the time it was worked the miners may not have understood a peculiar feature characteristic of all these veins, which is their pockety character. The heavy copper usually makes in pockets along the foot wall, and those are found by following the leaders or branches, or such indications as become familiar to the experienced, observing miner. It would not be a very expensive or difficult matter to free the mine of water. The distance between the two mines measured on the surface is 435 feet. The bearing of the veins is N. 43° E, and the northwesterly dip is 38° with the horizon. The mines are in the S. W. ¼ of Sec. 35, T. 51, R. 38. A branch of the Flint Steel river runs through the location, and it is on this that the stamps are placed. The stamp-mill is an old fashioned, out of date affair, and there is also a lack of water. The mine has returned to the stockholders the sum of $100,000 dividends.

One year ago Capt. Harris, in his annual report to the directors, called the attention of the company to the necessities of the mine, and recommended that an assessment of $2.50 per share be levied, by which the sum of $50,000 should be realized, and that the sum be expended in new machinery and pushing the openings. The directors voted to raise 50 cents per share—$10,000—and with this sum an average force of 44 men has been employed through the year, mining at such points as seemed to afford the best chance for good results, but these places did not prove to be as good as had been hoped for, in fact the production fell below the average yield of the vein. This work was mostly in the vicinity of No. 3 shaft in the 60th fathom level, west of the shaft, in the 50th fathom level, east of No. 2 in the 70th fathom level, both east and west of No. 3 shaft. The mining force was limited so that but a few points could be attacked. If there had been more there would have been a greater chance of some of them proving good, but the work was contracted and confined to what was esteemed to be the best points, but the outcome showed them to be otherwise.

The Knowlton vein, which is now esteemed the best of the Evergreen range lodes, crosses the property in the low ground where there is a good deal of drift so that it cannot be found otherwise than by sinking to the ledge near where the vein is supposed to cross and then drift to it. The Knowlton vein is probably about 800 feet northwest of the present mine, and if the Champion vein mine is unwatered it could be reached by a cross-cut from the bottom within a distance of 400 feet.

It is expected that at the coming annual meeting of the stockholders a more vigorous policy will be decided upon. The men chiefly interested in the Ridge own also the Hilton, Adventure, Superior, all of which are abandoned mines, and it would certainly be a great pity to have the Ridge consigned to the same fate.

The following are some of the details of the past year's work:

The amount of drifting done was 278 2-12 ft at a cost of per foot	$10 00
" " sinking shaft was 30 6-12 feet " " " "	40 93
" " " winzes was 22 6-12 " " " "	30 00
" " stoping, fathoms, 468 19-72 " " per cubic fathom	19 38
The amount of ground broken, 584 72-82 cubic fathoms, at a cost of, per cubic fathom	
The amount of mineral produced per cubic fathom stamped, lbs.,	248
No. of days stamp-mill run	40
No. of tons of rock treated in stamp-mill	1,448
Yield of mineral per ton of rock stamped, per cent	1.38
No. of lbs. of mineral produced to cubic fathom of ground broken	228¾

Which was obtained in form as follows, to wit:

Mass copper, per cubic fathom, pounds	152½
Stamp " " " " "	76¼
Total pounds " " "	228¾
No. of tons of rock broken in the mine	10,485
" " " hoisted	1,560
Total mining cost for the year	$26,200.36
" running expense for the year	36,509.39

Which includes the surface accounts.

Average monthly wages earned by miners, including supplies	$54 24
" " " " " on contract, less supplies	43 54
Average number of men working on company account	23.34
" " " " contract "	20
Making the total average number of men working	43.34
Average number of feet drilled per day by two men, hand drill work	11 9-12
Cost per foot of hole drilled, average	.36

This drilling applies to breast and back stopes, the company furnishing supplies, etc.

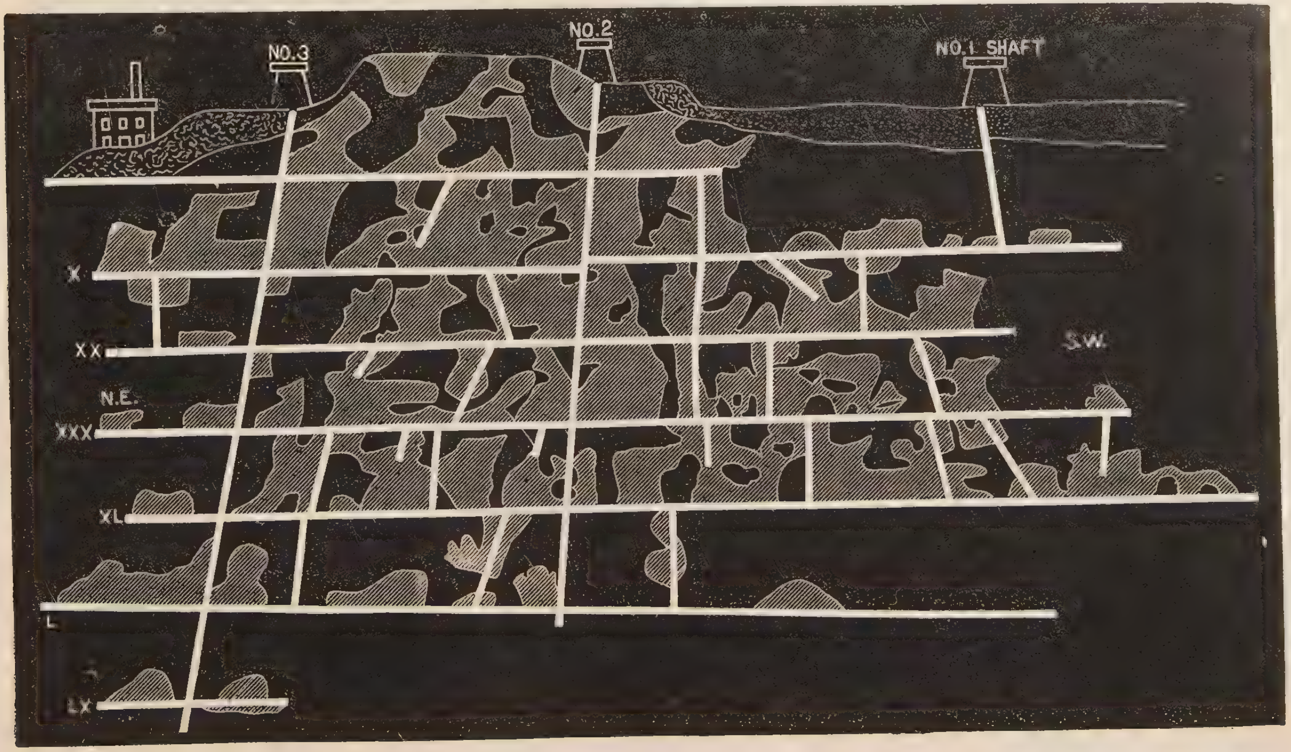
They made at this work, per day, per man	$2 11
Cost per foot of hole drilled, including cost of supplies	42

The rock selected for stamping only averages 20 per cent of the rock mined.

The product for the year was 49 masses, which weighed, pounds	57,610
Twenty-nine barrels stamp work, weighed, pounds	29,440

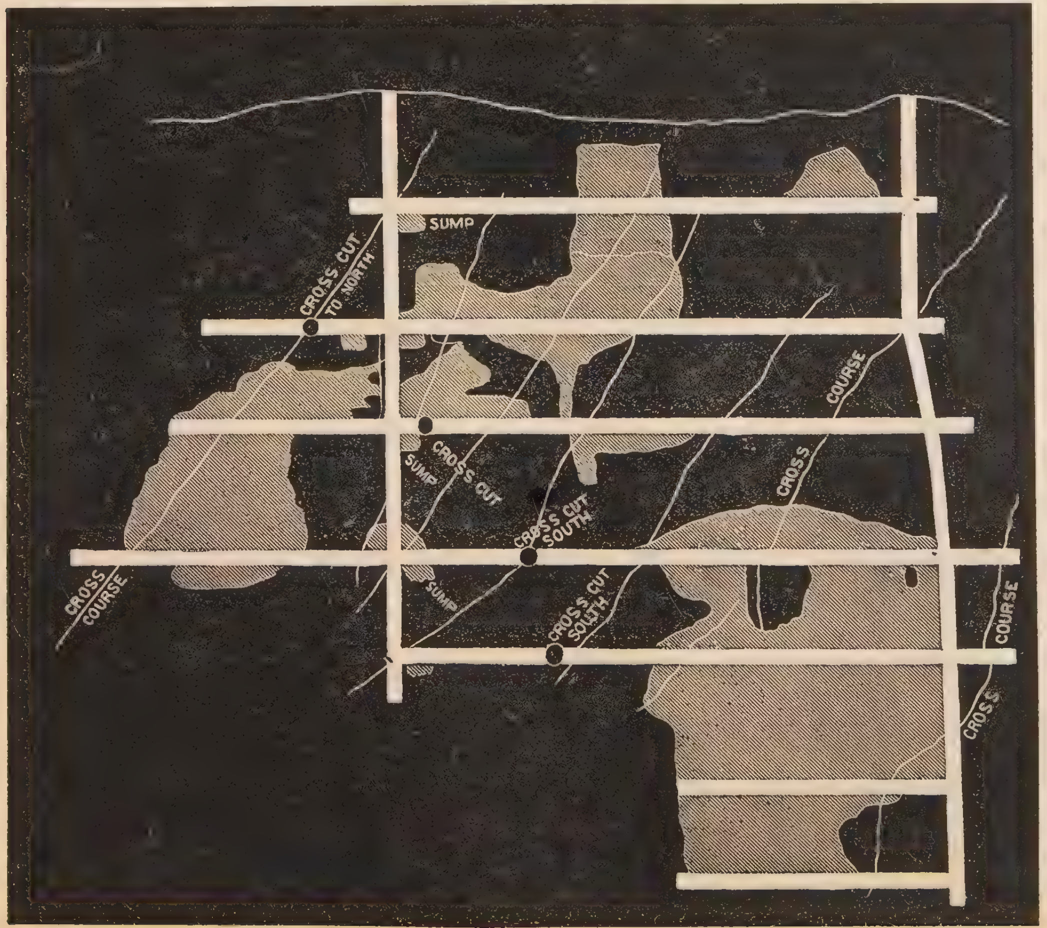
LONGITUDINAL SECTION OF THE RIDGE MINE, JAN., 1882.

Scale, 180 ft. to one inch.



LONGITUDINAL SECTION OLD RIDGE MINE, BUTLER LODE, JAN., 1883.

Scale, 120 ft. to one inch.



Total number of pounds of mineral........................... 119,910
" " " refined copper..................... 102,936
" " tons " " .... 51 936 lbs.

The following table shows the product of the mine for each year to the present time:

Years.	Tons.	Pounds.	Years.	Tons.	Pounds.
Previous to 1855......	30	.....	1871................	175	150
1855................	35	631	1872................	128	1,910
1856................	36	1,874	1873................	115	1,140
1857................	29	790	1874................	187	113
1858................	39	690	1875................	164	447
1859................	.....	.....	1876................	145	18
1864................	8	917	1877................	148	815
1865................	85	433	1878................	125	1,837
1866................	71	411	1879................	107	1,469
1867................	94	1,537	1880................	111	1,353
1868................	86	.....	1881................	117	1,606
1869................	126	1,840	1882................	51	936
1870................	122	1,400			

Total product of refined copper.............................. 2,345 317

The general business office of the company is No. 4 Exchange Place, New York. W. Hart Smith, Secretary and Treasurer; Thomas F. Mason, President; Samuel B. Harris, Agent, Greenland, Mich.

THE LAKE SUPERIOR MINING COMPANY.

A full account of this company was given in the report of 1880, and there is nothing more to add.

Office of the company 44 Exchange Place, New York. W. Hart Smith, Secretary and Treasurer; S. B. Harris, Agent.

The company's estate comprises the W. ½ and the W. ½ of the E. ½ of Sec. 13, and the E. ½ and the S. ½ N. W. ¼ of Sec. 4, T. 50, R. 39. The head waters of a branch of the Ontonagon river courses through a portion of the property, and also in the northwest part is a branch of the Flint Steel river, giving, possibly, water enough for a stamp-mill. The mine has produced all told 7 tons and 821 pounds of copper.

SUPERIOR MINING COMPANY.

Office, No. 19 Congress street, Boston, Mass. D. L. Demmon, Secretary and Treasurer; Wm. E. Parnell, Agent, Rockland, Mich.

The estate comprises the W. ½ and the W. ½ of the E. ½ of Sec. 2, and the W. ½ of the N. E. ¼ and the E. ½ of the N. W. ¼ and the S. W. ¼ of Sec. 11, and the N. ½ of the N. W. ¼ of Sec. 4, T. 50, R. 39. In the west part of the property the Flint Steel river has a sufficient magnitude to give a fair amount of water for a stamp-mill.

The mine location lies between the Rockland and the Flint Steel companies, in the S. ½ of Sec. 11. In fact the Superior and the Flint Steel were working on the same vein, with their openings connected, the former on the west side of the center line of the section, and the latter on the east side. It was one of the companies organized by the Minesota, and the property set off from the Minesota company's estate. The mine has long been idle.

Copper produced by the Superior mining company.

Years.	Tons.	Lbs.	Years.	Tons.	Lbs.
1858	-----	635	1866	33	-----
1859	-----	1,740	1867	18	400
1860	5	-----	1868	28	-----
1861	25	1,000	1869	2	521
1862	35	-----	1876	1	1,936
1863	33	500	1877	2	1,870
1864	51	788	1878	-----	1,965
1865	44	500	1879	-----	1,476
Total product				283	1,331

THE ADVENTURE.

This is an old mine. The Adventure bluff is one of the best known points in Ontonagon county; it was among the locations that were the earliest worked. But the work was never systematically done, adits were driven in at various points on the sides of the bluff, but seldom in a vein, or so as to cut a vein. Short shafts have been sunk here and there in various places, but not so as to regularly open a mine on any definite plan. There has been a good deal of dead work of this sort at the Adventure. There is a little excuse for it, to be found in the peculiar character of the formation itself, in the manner in which the veins occur and the copper is found. There seems to be considerable copper diffused through the rock, but there is a want of concentration; if the metal were contained within a limited space there would undoubtedly be a good, workable mine; it is to a great degree scattered through the trap, and affords too little indication as to where it may be found. Masses of copper were found scattered through the rock without law or rule, which if collected into a vein might have been profitably worked, but the mining for them seems to have been a blind search; they were found in the trap, sometimes without an apparent connection with a vein or being accompanied with the usual vein stone. The copper that was obtained here in an early day was mainly from irregular excavations, and in connection with the copper, an unusual amount of silver was also found. Of the latter the old miners relate having obtained many beautiful specimens, some of several pounds weight. The rock is a compact trap, and the vein stone carries the usual minerals, crystallized calcite, spar, feldspar, etc. The location is the N. ½ and the S. E. ¼ Sec. 35, and the W. ½ Sec. 36, T. 51, R. 38.

There is no water for a stamp-mill; a small branch of the Flint Steel heads in the property, but it affords very little water. The east face of the bluff is very steep, 100 feet and upwards in hight. Several veins that are exposed on its face have furnished much of the copper that has been mined here. A tunnel was driven in from this side and a large, irregular excavation made, appearing like the underground workings of a hematite ore mine. There are other workings at various points, but, as before stated, no regular well defined vein or lode was found, and for many years no other than tribute work has been done. An effort is now making to sell the property.

Office, No. 44 Exchange Place, New York. W. Hart Smith, Secretary and Treasurer; Thomas F. Mason, President; Samuel B. Harris, Agent, Greenland, Mich.

The amount of refined copper obtained in past years is as follows:

Years.	Tons.	Lbs.
Previous to 1855	34	-----
1855	31	34
1856	71	1,336
1857	116	1,941
1858	57	1,678
1859	99	431
1860	21	749
1861	2	676
1862	11	89
1864	-----	1,755
1865	3	1,491
1866	2	439
1869	-----	1,154
1870	1	931
1871	3	339
1872	8	1,055
1873	2	1,345
1874	3	165
1875	15	470
1876	20	784
1877	32	609
1878	27	115
1879	10	1,785
1880	1	951
1881	3	1,500
1882	-----	429
Total	583	303

HILTON MINING COMPANY.

The Hilton mine lies next east from the Adventure, in the Evergreen range, being the E. ½ of Sec. 36, T. 51, R. 38.

There is also a small branch of the Flint Steel river that has its rise in this property, but does not afford enough water for a stamp-mill. The mine belongs to the same men who own the Ridge and the Adventure, and it is said that they are now offering it for sale. So far as has been discovered it does not possess much value as a mining property; what mining work was done did not develop anything of importance as indicative that a paying mine could be opened. Two shafts were sunk to a depth of about 100 feet, and an adit 350 feet in length was driven in, and about $45,000 expended in this work and in construction account.

The copper produced at different times has been as follows:

Years.	Tons.	Pounds.
Years prior to 1855	2	-----
1856	-----	705
1864	5	1,179
1865	3	411
1866	2	1,767
1870	1	1,345
1877	1	1,555
1878	3	807
1879	1	50
Total	21	1,819

Office, 44 Exchange Place, New York. W. Hart Smith, Secretary and Treasurer; Thomas F. Mason, President; Samuel B. Harris, Agent, Greenland, Mich.

AZTEC COPPER COMPANY.

The Aztec is one of the old mines of this range that was worked in an early day in a desultory way, and a good deal of copper was found. These workings were mainly in the ancient pits, of which the Aztec bluff possessed an unusual number. All the veins had been worked, and many of the excavations had been made to a considerable depth. By clearing out these old pits a good deal of copper was obtained. On one of the veins they appeared in succession along the whole extent on the surface, filled up with dirt and debris; they could be recognized by the depressions and mounds of earth beside them; when explored the evidence of former working became very apparent. As elsewhere in the copper country, these ancient pits contained in the bottom beneath the earth with which they had become filled up, stone hammers, remains of fire, etc., and not unfrequently masses of copper which the ancient miners either from inability or otherwise had never removed.

By sinking in one of these pits 140 tons of copper were obtained, and it is claimed that in all of them, along on this vein, copper was found showing it to be good copper ground. Capt. Chynoweth, who for the past few years has had charge of what little work has been done here by the present company, recommends that a drift be extended beneath these ancient diggings, far enough below the bottom of them to prove the ground. The same uncertainty and irregularity exists here as at the Adventure, as regards the veins; the copper is associated with vein matter when found, but it is in isolated masses, pockets, and bunches of amygdaloid in the trap, so that wherever work may be begun it would soon appear that they were in the wrong place, or that at some other point it would be better.

Systematic mining work here is a difficult task. The veins do not seem to have much continuity, or at least not to such a degree that they can be followed in mining. There are short veins, fissures, feeders, etc., but they occur in the trap, and while there is a continuity it is not always easy to make it out. Capt. Chynoweth's plan is certainly a very judicious one; a drift 750 feet long would extend continuously beneath the old workings in the Knowlton vein, and bring the end of the drift 100 feet under the surface at the "big pit." A shaft could be made here and the driving extend in either direction to meet. If it should prove productive in copper there would be opened a large back of ground for stoping.

This work was begun, but has not been completed. Capt. Huddlestone resided on the location, and worked with a force of about six men, but owing to his death, in July last, all work was discontinued. There are a few thousand dollars in the treasury, but one would think it is hardly worth while to mine here on so small a scale as has thus far been done. There are some buildings and a stamp-mill, and a good deal of excavating, sinking, and drifting, in the aggregate, in times past, has been done. The location is next east from the Hilton, and the bluff is opposite to and facing the Belt mines. The description is the W. ½ of Sec. 31, T. 51, R. 37. The company also owns Sec. 10, and ¾ of Sec. 14, and Sec. 12, except N. E. ¼, and the N. ½ of the S. E. ¼, all in T. 51, R. 37. No work has been done at the mine since it shut down in July last. There is not enough water for a stamp-mill of much capacity.

The following are the statistics of the year's work:

Three men stoping in the Champion vein, wages	$777 03
Mining supplies	60 75
Total expenses for the year	1,420 59
Mineral produced, pounds	4,204
Mining supplies on hand, value	$210 00

Dwelling-houses are in fair condition, only one is occupied.

Pounds refined copper produced	3,129

Office, Boston, Mass. August Page, Secretary and Treasurer, John Chynoweth, Agent, Greenland, Mich.

The following shows the product of refined copper obtained in the mine for past years:

Years.	Tons.	Lbs.	Years.	Tons.	Lbs.
Previous to 1855	19	-----	1870	12	1,288
1855	1	1,467	1871	6	1,153
1856	25	1,139	1872	5	1,550
1857	14	1,361	1874	6	1,412
1858	3	251	1875	8	252
1859	9	493	1876	13	1,378
1860	3	203	1877	14	1,934
1865	4	700	1878	11	1,392
1866	16	-----	1879	8	737
1867	40	-----	1880	2	1,757
1868	36	-----	1881	-----	1,734
1869	87	1,257	1882	1	1,129
Total product				353	863

THE BELT COPPER MINES, LIMITED.

This is a new company organized during the past year to work the old Bohemian, Great Western, and Penn mines, all of which are now owned by the Belt company.

The estate consists of 3,752 acres, being the E. ½ of Sec. 31, and N. W. ¼ Sec. 32, and S. W. ¼ and E. ½ of N. W. ¼ and W. ½ N. E. ¼ of Sec. 29, and the S. E. ¼ and S. ½ of the N. W. ¼ of Sec. 30, and all of Sec. 2, and S. E. ¼ Sec. 3, T. 51, R. 37, and N. E. ¼ of Sec. 25, and E. ½ S. E. ¼ and E. ½ of the S. W. ¼ of the S. E. ¼ of Sec. 26, T. 51, R. 38, and the W. ½ of Sec. 36, and E. ½ Sec. 35, and the W. ½ Sec. 25, and the E. ½ Sec. 26, T. 52, R. 37, and the S. W. ¼ Sec. 12, and S. E. ¼ and the S. ½ of the N. E. ¼ and the E. ½ S. W. ¼ and the S. E. ¼ of the N. W. ¼ of Sec. 3, T. 50, R. 38. The mine location is in the E. ½ of Sec. 31, lying next east from the Aztec.

It is an old location. The original company formed to work it was organized in 1848, about which time work was begun. The location was early known as the Piscataqua, and was sold to the Bohemian company in 1853. The extent of the underground workings is shown in the longitudinal section. In addition to what is here represented the new company is now sinking a shaft which is supposed to be in the Knowlton vein. This shaft is down—February 1, 1883—90 feet. At the time of my visit it did not look very promising, there was no copper showing in the bottom, and the lode did not appear to be well defined; it showed a preponderance of pretty compact trap. Nearer the surface considerable copper was found, and it may again occur. The mine is in the Champion vein, and does not seem to have ever been very productive, inasmuch as the total amount of copper which it has yielded in the thirty-two years since it was first worked is only 216¼ tons. Judging from the extent of the opening which has been made in this vein, and the amount of copper which it afforded, one would conclude that the company was wise in abandoning it. The old stopes and the vein along the old drifts now do not show much copper, in fact it is a difficult matter to find any, and it is apparent that the miners experienced trouble in following the vein. The new shaft sinking in the Knowlton vein is about 400 feet northwest from the mine, near the section line (north line of Sec. 30) and a few hundred feet east from the ¼ post.

Preparations are making to build a stamp-mill at a distance one and a half miles northeast from the mine in Sec. 29, near the highway leading to Houghton. The land for the site of the mill was recently purchased from the Canal company. The location for the mill is an admirable one; it is on the Fire Steel river, which will probably afford a sufficient amount of water to work up all the rock the mines of the company will furnish. The grade to the mill is 60 feet to the mile. It is the intention to build a railroad from the mine to the mill, and operate it with a locomotive.

They are now sinking No. 1 shaft below the 2d level, and are down 20 feet; are also driving the 1st and 2d levels from both ends of each. No. 1 was formerly used as the hoisting shaft, and it has been repaired so as to be now used for the same purpose. The old hoisting engine is in use, but will be displaced by a new engine of far greater power, which has been ordered, as has also the proper winding machinery, etc., to accompany it. To the old machines has just been added one-half of a Rand duplex compressor, 16½ inches by 30 inches. The compressor has started with two drills. Owing to the lateness of the season the mortar in the foundation did not properly set, and had become loosened so that at the time of my visit the machine was idle for repairs on the foundation. The force employed is now 75 men, of whom 22 are miners. The dip of the shafts is between 35° and 40° northwesterly, the magnetic bearing is about N. 35° E. The veins, so called, are belts of amygdaloid trap. As before stated, the trap, devoid of amygdaloid, greatly predominating. The prevailing vein minerals are calc, spar, and epidote.

The work of unwatering the mine was begun last April, but the company did not open the mining work until in October last. The unwatering was done by Mr. Brand, under instructions from the parties who subsequently purchased the property, in order that a better opportunity could be afforded for examination. The purchasers are Englishmen, and the officers of the company are all residents of England, where the stock is also held. They are evidently gentlemen of high social consideration, and are greatly impressed with the value of their property. It is certainly to be hoped that their expectations respecting dividends may be realized, though as yet there is little to show as a groundwork upon which to base such anticipations as the company have given expression to. The capital stock is £250,000, divided in 50,000 shares of $25 each. Sixteen thousand of these shares are allotted to the vendors as fully paid up, and 34,000 shares were offered for sale subject to assessment. The company paid for the property, according to their prospectus, the sum of $825,000. The vendors are Francis Ellenhauser and A. B. Cunningham, who had purchased from the agents of the former owners.

The officers are The Right Honorable the Earl Denbigh, President; S. Coxon, K. H. James, A. B. Kendall, Malcolm Low, John Sanderson, S. Wolseley, Directors, London, England; Local Director, to comply with the law, Alfred Meads; Julian Sanderson, Secretary, St. Swithian Lane, London, England.

Messrs. E. P. Rathburn and S. R. Coxon, mining engineers, who came from England to this country to examine this property, state in a cablegram dated at Ontonagon, Mich., June 26, 1882, respecting these mines, that "the quantity of mineral is practically inexhaustible, that there are ample water power and railroad facilities;" that two per cent of copper in the rock is a very low estimate. They say in this dispatch that an expenditure of $200,000 will put the mine in shape for an output of 200,000 tons of rock per annum. The cost of producing they state should not reach $4 per ton for mining, milling, smelting, and all other expenses. In conclusion it is stated in this dispatch that after a careful examination of the principal mines in this district they are convinced that this company possesses one of the most valuable properties on Lake Superior.

Another gentleman makes a report on this property that is printed in the prospectus, in which he states "that with a similar equipment the Belt can be made as productive and profitable as the Quincy."

A person of considerable acquaintance in the copper region, but resident elsewhere, having been requested to examine and report as to the amount of copper in sight at the Belt mine, replies, and his statement is published by the new company, "in regard to the amount of the copper in sight the bluff, 100 feet high and 1,500 feet long, contains 500,000 tons." "But taking the depth of the mine, 200 feet, and width of the vein, 50 feet, and its explored length of 5,000 feet, gives 50,000,000 cubic feet, or 4,000,000 tons in sight, and this not the twentieth part in the vein before it leaves the property." "The situation is best on the mineral range; with proper machinery, etc., nothing can prevent making a larger output than the Calumet and Hecla, and receiving equal dividends!"

The previous non-development of the property is accounted for by the lack of railroad facilities. Very much of a similar tenor is given in this prospectus of the company, which is calculated to raise the expectations of those interested, in a high degree. The greatest producing mines, as the Calumet and Hecla, Quincy, etc., are referred to as the basis of comparison, and the prediction is made that the new mine will be paying dividends in six months.

"The reports testify that extensive surface developments have been carried out, and the mines are opened by numerous shafts and levels, the extraction and treatment of the copper rock merely awaiting the erection of modern machinery and appliances."

I have made the above somewhat extended extracts, as this purchase is a matter of considerable importance to Ontonagon county, and in fact to the entire copper region. The high position of the purchasing parties, the large amount of money which was paid for the property, and the extensive plan of operations which they propose to adopt, their evident good faith and great hopes of reward, make this particular undertaking a matter of no ordinary interest; besides it has been the desire of men in the Upper Peninsula to get English capital directly interested in our mines; and these gentlemen are fully competent, in a pecuniary way, to undertake to develop and operate a large copper mine. As this is the first undertaking of the kind made by London parties, it is greatly hoped that their success shall be such as will encourage the investment of foreign capital in our mines. English capital has been wary of Lake Superior mines, and if the experience of these gentlemen should be an unfortunate one it may prove disastrous in more senses than one.

Since writing the preceding I find the following synopsis in the Northwestern Mining Journal, and conclude to insert it here. The whole is a valuable piece of contemporary mining history, and may also be good for future reference:

"The long pending negotiations between certain English capitalists represented by Messrs. Ellershausen, Coxon, and Rathbone, who recently visited the lake, and the owners of the Bohemian (International), Great Western and Penn mining properties in Ontonagon county, are about to be brought to a close by the payment of the purchase price on the first named mine, which will in all probability be made on Monday, the 29th inst. The payment for the Great Western and Penn was made on Friday last, Mr. J. G. Henza, of Philadelphia, receiving the money for the former, and Hon. W. D. Williams that for the latter company. The consummation of this sale will be the means of introducing a large amount of capital into Ontonagon county, for the purchasers are men of great wealth, and as their plan of operations (set forth in this subjoined circular) shows, contemplate development of their mineral estate on a scale commensurate with its territorial extent and what is believed to be its great copper resources, and have provided ample capital for carrying their programme into effect."

The prospectus of the Belt company, published in full in a late issue of the London Mining Journal, is, in main, as follows:

THE BELT COPPER MINES, LIMITED.

Registered under the companies' acts, 1862 to 1880. Capital £250,000, divided into 50,000 shares of £5 each; of which 16,000 are to be allotted to the vendors, credited as fully paid up, and the balance, 34,000 shares, are now offered for public subscription, payable as follows:—5s. on application, £2 5s. on allotment, and the balance in such calls as the directors may think fit, but no further call to be payable sooner than two months after allotment.

Directors: The Right Honorable the Earl of Denbigh, 2 Cromwell house S. W.; S. Coxon, Esq., M. Inst. C. E., 23 Great George street, Westminster S. W.; K. H. James, Esq. (Messrs. James and Shakspeare), 10 Austin Friars, E. C.; Arthur George Kendall, Esq. (Messrs. H. Kendall and Sons), 12 Great Winchester street, E. C.; Malcolm Low, Esq., J. P., 22 Roland Gardens, S. W.; John Sandeman (Messrs. George G. Sandeman, Sons and Co.), 20 St. Swithin's Lane, E. C.; E. Wolseley, Esq., 151 Cromwell Road, S. W.; with power to add to their number.

Local Director: In compliance with the law of the State of Michigan, Alfred Meads, Esq., Ontonagon, U. S.; Bankers, Messrs. Martin & Co., Lombard street, E. C.; Brokers, Messrs. Laurence, Sons & Gardner, 3 Copthall Court, E. C.; Solicitors, Messrs. Francis & Johnson, 22 Austin Friars, E. C.; Secretary, Julian Sandeman, Esq. Temporary offices, 62 Palace Chambers, Westminster, W.

One of the vendors will join the board after allotment of shares.

On the recommendation of the Royal School of Mines, Messrs. Bainbridge, Seymour, and Rathbone, mining engineers, were appointed to inspect and report on the Belt copper mines, and one of the directors, Mr. Coxon, M. Inst. C. E., was deputed to accompany Mr. Rathbone and personally inspect the property.

This company has been formed for the purpose of acquiring valuable native copper properties and mines know as the Penn, Bohemian, and Great Western, situated in Ontonagon county, State of Michigan, Lake Superior, consisting (as stated in the reports) of 3,272 acres freehold land, which are sold as unencumbered by debt or royalty of any kind. The property covers an extent of over four miles on the great Lake Superior copper belt, which already furnishes about one-quarter of the copper produce of the world, and on which is situated the Calumet and Hecla Mine, which according to the reports pays its shareholders annually over £400,000 sterling. Some of the important mines on the same mineral range are the Quincy, the Atlantic, Osceola, Phœnix, and the first, as appears from the manager's report, has paid in dividends nearly $3,000,000, the last dividend being at the rate of 44 per cent per annum.

The Lake Superior copper is pronounced to be chemically pure for practical purposes, leaving no residuum when dissolved in pure nitric acid, giving no precipitate when the solution is heated with ammonia, containing no trace of arsenic or other metal. For conductivity wire and cartridge metal it is prefer-able to most, and thus it always commands a ready market. The Belt copper mines consist of two distinct properties: 1. The Great Western and Bohemian. 2. The Penn.

No. 1. The Great Western and Bohemian. These mines, which are purchased as a going concern, have an area of 1,832 acres, and an extent of 1½ miles on the great copper belt which carries the celebrated well-defined and continuous native copper veins, yielding on the output more than two per cent of pure copper. Its village, called Bohemia, is one of importance, and it is anticipated will very shortly be in direct railway communication with Chicago. The reports testify that extensive surface developments have been carried out, and the mines are opened by numerous shafts and levels, the extraction and treatment of the ore awaiting merely the erection of modern machinery and appliances.

Fuel, timber, and water are abundant throughout the property, and its value for mining purposes is fully explained in the reports. The want of railway communication and economical means of transport to and from the shipping ports on the lake and lack of capital have hitherto impeded the full development of this property.

These difficulties the directors are advised will be removed. In the first place by direct railway communication, not only with both shores of the lake, but also with Chicago by the Marquette, Houghton and Ontonagon Railway (which is nearly completed), as shown on the map, and the works on the unfinished portion of that line are being actively pushed on, and in the second place, by supplying sufficient capital to this company to obtain machinery of the latest construction for rock drilling, crushing, and washing, and other labor-saving appliances of all kinds, the cost of production will be reduced to the lowest point of economical working.

The situation of the veins carrying the native copper should admit of their being worked for some years from adit levels, and it is intended to erect machinery adequate to the extraction and treatment of about 200,000 tons annually, which, including the cost of the construction and equipment of 1½ miles of railway to carry the ore to the stamp-mills to be erected on the river, will involve an expenditure of about £40,000. These works can probably be erected and the railway completed by November next. The usual and necessary houses for the workmen have been erected, and labor is readily obtainable.

It is calculated by the vendors that the present development of the property, assisted by the above named expenditure of £40,000 for machinery, should enable the company to extract and treat 180,000 to 200,000 tons ore per annum, say:

Air compressors and power drills	£8,000
One and one-half miles railway	3,900
Rolling stock	4,000
Stamp-mills	25,000
	£40,000

To illustrate the actual expenses of mining and producing ingot copper in this district, the following figures are quoted from the annual reports of two neighboring mines, viz., the Atlantic and Quincy:

The Atlantic output is 169,000 tons (of 2,000 lbs.). Mining, milling, smelting, and all expenses, $407,933=$2.41, or £81,586=9s. 8½d. per ton.

The Quincy output is 126,000 tons (of 2,000 lbs.). Mining, milling, smelting, and all expenses, \$505,344=\$4.10, or £101,068=16s. per ton.

Owing to the completion of the railway connection to within 1½ miles of property, the company should work at even a cheaper rate than either of these mines, but assuming 16s. per ton for expenses the following would result from an output of only 100,000 tons (of 2,000 lbs.) per annum. This with a product of 2 per cent would give:

4,000,000 lbs. ingot copper at 18c. per lb., \$720,000, or	£144,000
Deduct cost of mining, milling, smelting, administration, and all other expenses, \$4 or 16s. per ton of ore, \$400,000, or	80,000
	£64,000

Which results are far below what is anticipated by the estimates of the engineers.

No. 2. The Penn. This is reported to be an extensive and very important property, six miles from Bohemian, having an area of 1,440 acres, and a great extent on the mineral belt, viz., 20 miles. The reports show that the celebrated veins are continuous and well defined. Timber is very abundant, both for fuel and for mining purposes; there is also a plentiful and constant supply of water. The property is near enough to Bohemian to be worked under the same management.

The directors of the company have reason to believe that if it be considered advisable this portion of the property might be sold at such a price as would reduce the present cost of the mines without interfering in any way with the results estimated above. If, on the other hand, the directors feel encouraged to do so, they can, at some future period, develop this portion, and thus place the Belt copper mines in a position of greater importance with regard to extent and working. It is thus shown that the Belt copper mines possess two distinct properties, each of them, taken individually, of great value.

No. 1. The Great Western and Bohemian should yield a net income of say £64,000.

No. 2. The Penn can be either realized or can be developed as may hereafter seem desirable.

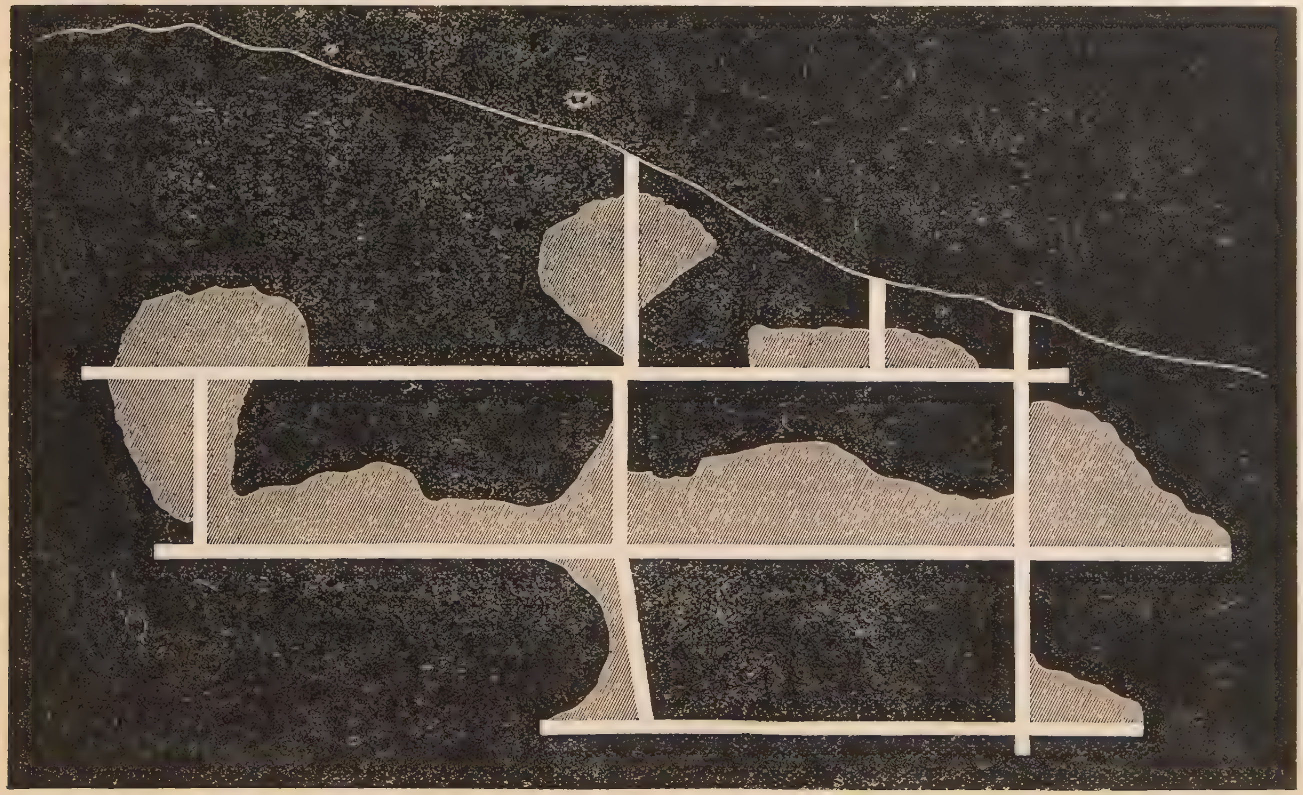
Prospectus and reports on the properties comprising the Belt copper mines can be had at the bankers, brokers, and the officers of the company.

The vendors sell as the absolute owners of the freehold to the company, and have fixed the price to be paid at £165,000, of which they agree to take at least £80,000 in shares credited as fully paid up, and so much more in shares as will leave the company at least £75,000 working capital. By the contract with the vendors it is provided that if shares in the company to the amount of £100,000 shall not be prescribed and be paid for in cash by responsible persons, the agreement with the vendors shall be enforceable by them. £100,000 of the capital has been guaranteed by a number of responsible persons (to whom a commission for so doing will be paid entirely by the vendors). Two of the directors are among the guarantors. The guarantors being numerous, a list of them with dates and names of parties may be seen at the offices of the company. Subscribers for shares will accept this as sufficient notice to comply with the statute on that behalf.

The contract for purchase, which is by deed, is dated 14th July, 1882, and is made between Francis Ellershausen, Esq., and A. B. Cunningham, Esq. (vendors), of the one part, [who as vendors pay the preliminary and other expenses

LONGITUDINAL SECTION BELT MINE, JAN., 1883.

Scale, 90 ft. to one inch,



of the formation and incorporation of the company, and also all commissions, in connection with obtaining the capital, advertising, printing, or of any other description whatsoever, up to the time of allotment of shares, and in addition all expenses of conveyance of property] and the Belt copper mines company (limited) of the other part.

The following cablegram was sent on account of proprietors of the Belt mines to Messrs. Bainbridge, Seymour, and Rathbone, London:

BOHEMIAN MINES, ONTONAGON COUNTY,
MICHIGAN, U. S. A., 28th June, 1882.

GENTLEMEN.—Agreeable to your instructions, I have visited and thoroughly examined your mining locations in the above district, and have pleasure in cabling you my report. Your properties, the Bohemian, Great Western, and Penn, comprising 3,272 acres, are most advantageously situated, and possess abundance of prime timber, ample water power, labor, and railway facilities. The quantity of mineral is practically inexhaustible. After a careful examination of your ore, and comparing it with the produce of neighboring mines, I am of the opinion that 2 per cent of copper is a very moderate estimate of its richness. I should say £40,000 is amply sufficient for the immediate development of the mines; this sum judiciously expended should equip the works for an output of 200,000 tons per annum. The cost of producing ought not to reach $4 per ton for mining, milling, smelting, and all other expenses. In conclusion, I may state that after an examination of the principal mines in this district, I am convinced that you possess one of the most valuable properties on Lake Superior.

(Signed) EDGAR P. RATHBONE.

I fully concur in the above, S. Coxon.

The Belt is a large estate, and possesses many advantages as a prospective mining property, among which are a large extent of the mineral range, water conveniently accessible for stamp-mill, an abundance of timber for present purposes, and the fact that the property is crossed by all the lodes in the Evergreen range. But it is also a fact that the productive value of these lodes on this property is yet to be determined. So far as it has been worked in the past, and so far as the present appearance of the mine indicates, there is not much basis afforded for the extraordinary estimates which have be made.

It is intended to put into the mill three head of Ball stamps, capable of treating 500 tons of rock per day. The local management is in the hands of Oscar Brand, Esq., an English gentleman of much mining experience in the copper mines of Newfoundland and Nova Scotia. Mr. Brand expresses confidence in the success of the Belt mining scheme, and esteems the outlook in the mine as altogether favorable. He has been on the ground since April last, and superintended the unwatering of the mine.

The mining captain is John Trevarrow, an old resident and miner in Ontonagon county. Charles Chynoweth, Engineer and Clerk.

The following is the product of the Bohemian mine in past years:

Years.	Tons.	Pounds.	Years.	Tons.	Pounds.
Previous to 1855	6	-----	1873	50	845
1859	1	1,903	1874	3	1,535
1863	16	563	1875	4	762
1864	11	69	1876	5	635
1865	31	1,502	1877	8	1,703
1866	34	1,823	1878	-----	1,488
1870	4	630	1879	-----	417
1871	9	1,482	1882	2	1,625
1872	32	1,100			
Total product				219	100

INDIANA MINE.

This mine is two miles northeast from the Belt, in the southwest corner of Sec. 21, T. 51, R. 37. It is crossed by the Houghton road; that is by the highway which runs along the range from Portage lake to Ontonagon. The Fire Steel river also crosses the location, and gives water for a stamp-mill in moderate quantity. Considerable work was done here from 1862 to 1865, three years. Two shafts were sunk to the 3d level, and some drifting done, a number of houses were built, a hoisting engine erected, and a stamp-mill was built. No work has been done since 1865.

Office of the company, New York. Jas. M. Mills, Secretary and Treasurer.

Some $200,000 were expended with no return.

THE HENWOOD MINES.

It will be seen from the accompanying section that considerable mining work was done here in an early day. It is an old mine and is generally known by its former name, the Douglass Houghton; the description is the northwest quarter of Sec. 15, T. 51, R. 37. Work was begun here as early as 1846 in a small way, and a few years later, 1850, began to be vigorously pushed.

Strong hopes were maintained of the success of the mine, based on the well defined character of the vein, and the fact that it was well charged with copper, but at greater depth it did not prove so encouraging. The vein had a width of 2 to 3 feet near the surface, with a quartzose vein stone; it was thought to possess the characteristics of the Minesota conglomerate vein, but I am not aware that this was ever made out as a fact. It is said to have the characteristics of a contact vein and to underlie a belt of conglomerate, similar in these respects to the Minesota vein.

The company built a stamp mill on a branch of the Fire Steel river with 16 heads of Gates stamps; also a double cylinder hoisting engine, 12x48, was procured and is still at the mine.

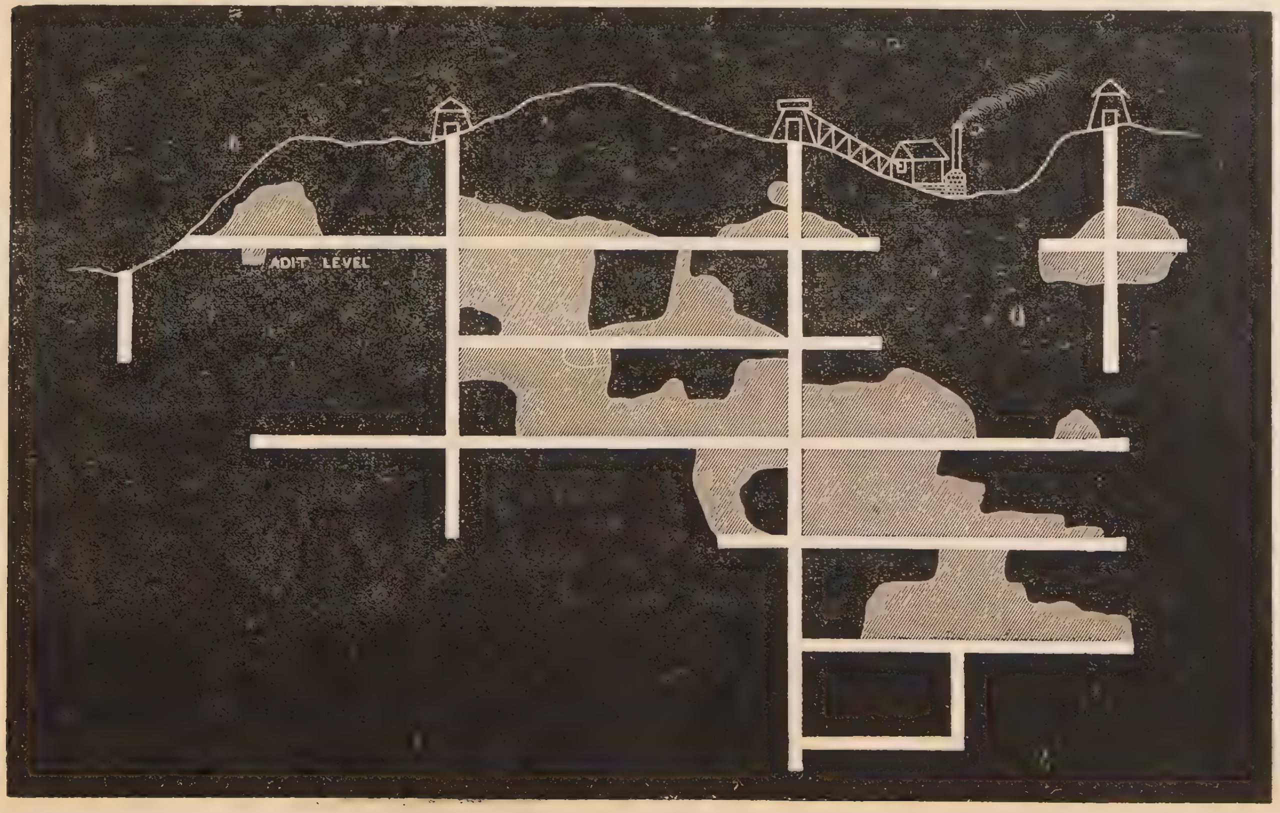
The company shut down in 1868. In March of that year Mr. Fred. McKay, who had been agent, was succeeded by Frank White, Esq., now agent of the Quincy mine, and in July thereafter the company shut down, after which, for the rest of the year, Capt. John Trevarrow continued to work this mine on tribute. The owners of the mine were New York parties, Wm. B. Ogden, Pres., Jas. R. Young, Sec. and Treas.

Since 1868 the mine has not been worked on company account. In addition to the N.W. ¼ of Sec. 15, on which the mine is situated, the company owns the E. ½ of Sec. 15, and the W. ½ of Sec. 14, and forty acres in section 11, on which latter piece occurs a fall in the Fire Steel river of upwards of 40 feet in height, affording a sufficient power, if utilized for that purpose, to operate all the machinery of a mine.

In 1864, February, the company was reörganized, taking the name of Henwood mines. For the past few years no attention has been given to the property by the owners, and they have allowed it to be sold for taxes, the purchaser being Capt. Trevarrow. The mine is in the south part of Houghton county. The mine produced as follows:

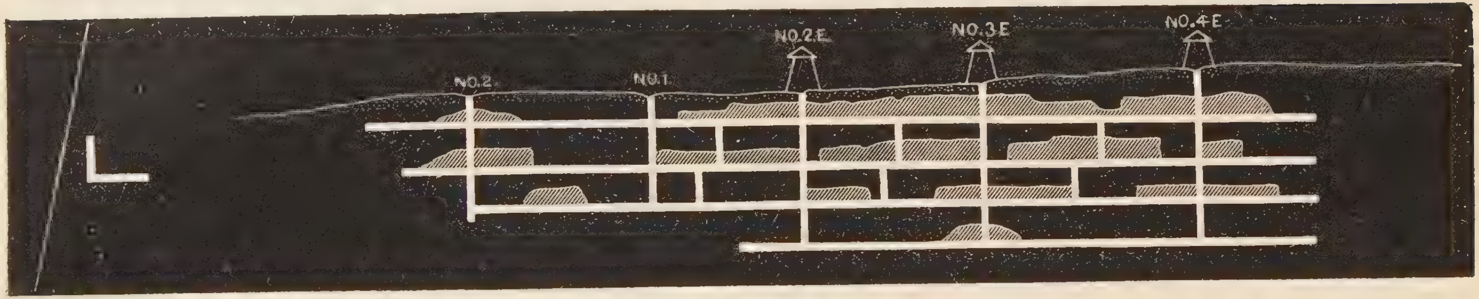
LONGITUDINAL SECTION HENWOOD MINE, JAN., 1883.

Scale, 120 ft. to one inch.



LONGITUDINAL SECTION OF THE TOLTEC MINE, ONTONAGON COUNTY, MICH.

Scale, 300 ft. to one inch.



Years.	Tons.	Pounds.	Years.	Tons.	Pounds.
Previous to 1860	----	----	1867	32	1,872
1860	13	1,240	1868	25	109
1865	3	809	1877	1	1,258
1866	8	209			
Total product				84	1,502

THE TOLTEC CONSOLIDATED MINING CO.

Was one of the early companies that once held an important position in the mining world. It was formed by consolidating, in 1855, the Farm and Toltec locations, and as will be seen in the accompaning section quite an extensive mine was opened. The indications were thought to be good, and so great confidence was felt in the mine that the stock ruled high in the Boston stock market. But the distribution of the metal in the vein proved very irregular; enough was found to excite hopes, but not enough to make profits. The mine was well and systematically opened, but so far as could be ascertained there was too much poor ground in proportion to the rich. In addition to the extended underground opening, large and rather extravagant surface improvements were made.

The company worked two years and expended half a million dollars in addition to what was obtained from the sales of copper, and then finally permanently shut down.

The location of the mine is in the south half of section twenty-five, township fifty-one north, in range thirty-eight west.

The character of the lode is said to vary very much in different parts of the mine; at No. 4 shaft it dips at an angle of 64° with the horizon, and is very narrow; at No. 3 shaft it is 20 inches wide and dips 56°, and was found to be more productive. At other points in the mine it is from five inches to several feet in width, and as before said, equally as variable in copper.

The gangue of the vein is quartz, with some prehnite, etc. Office of the company, Boston, Mass. Joseph Vila, Sec. and Treas.

Product of the Toltec consolidated.

Years.	Tons.	Pounds.	Years.	Tons.	Pounds.
Years previous to 1855	50	-----	1858	-----	-----
1855	30	-----	1859	16	186
1856	59	401	1860	3	1,140
1857	41	1,036	1866	6	670
Total product				206	1,433

The location joins the Belt, Adventure, and Hilton mines.

The following tables from Jos. G. Martin's stock report show the stock quotations of some of the copper mines for the years given.

LAKE SUPERIOR MINING COMPANIES:

LAKE SUPERIOR COPPER MINING COS.	1879. Lowest and Highest.	1880. Lowest and Highest.	1881. Lowest and Highest.	Number of shares.	Assessed per share, total.		Dividends. When Paid.
					Jan. 1882.	Jan. 1883.	1882.
Allouez	3 10	2¼ 27	1⅞ 5½	80,000	14.75	15 25	----------
Atlantic	12½ 13	12½ 29¼	11 19¾	40,000	-------	-------	$2 Feb. 1, 1882
Calumet and Hecla	*170 *295	200 *260	201 258¾	100,000	12.00	12.00	$5 Fe., May, Au., No.
Central	*24 43½	35 52	28 44	20,000	5.00	5.00	$2½ Feb. 4,—Aug. 0
Copper Falls	12½c 8¼	5 20	2½ 16½	40,000	21.25	21.25	----------
Franklin	4 31	10¾ 50	10¼ 18½	40,000	8.00	8.00	----------
Huron	----------	2 15	50c 7⅛	40,000	3.00	3.00	----------
National	1 7¾	1½ 7½	25c †3½	40,000	6.00	6.00	----------
Osceola	10 35	*30 *48	28½ 40	50,000	17.60	17 60	$1 Ap. J'y, Oct. Jan.
Pewabic	20c †40	11¼ 69½	10 25	40,000	10.63	12.63	----------
Phœnix	5 6¼	1⅞ 16	1½ 3¾	40,000	20.00	21.00	----------
Quincy	10 33½	22 46	31½ 51½	40,000	10.00	10.00	$8 Feb. 15, $5 Aug. 20
Ridge	75c 9½	3 10	3 7	20,000	20 00	20.50	----------
Silver Islet	20 65	†11 †55	18 48	40,000	6,50	8.50	----------

LAKE SUPERIOR COPPER MINING COS.	1882 Jan. 3.	Jan. 3 to April 1.		1882 April 1.	April 1 to July 1.		1882 July 1.	July 1 to October 2.		1882 Oct. 2,	October 2 to January 2.		1883 Jan. 2.
		Low.	High.		Low.	High.		Low.	High.		Low.	High.	
Allouez	3½	2½	3½	2½	1 15-16	2½	2	2	3⅛	2½	2	2⅞	†2½
Atlantic	17½	*13½	19	14	13	14½	14½	14½	17	16½	16	17	17
Calumet and Hecla	239	*231	252½	245	*230	*248	248	*243	*255	250	*245	254½	251
Central	31	*21½	31	*21½	------	------	20	------	------	25	------	------	25
Copper Falls	4¼	2	4¼	3½	2	3½	2	------	------	1½	1½	2½	2
Franklin	14¾	10	15½	10¾	10	13⅛	13	13	17	16	13	16¼	14½
Huron	3⅝	1½	3¾	1½	11-16	1⅞	1½	1½	4	3¼	1¾	3¼	2
National	3⅛	2	3⅜	2	1⅝	2	1⅝	1⅝	2½	2⅛	1⅜	2⅛	1½
Osceola	31¾	*30	*38	*38	*31½	*38	31¾	31½	35	35	*31½	36	*33
Pewabic	16¼	11	17	12	9½	13	9½	9½	14¾	14¼	6¼	14¼	†10½
Phœnix	3¼	2	3½	2¾	50c	2¾	50c	50c†	1¾	†1½	------	------	50c
Quincy	52	*40	57	45¾	45½	55	55	*55	69½	67¼	57¼	70	63
Ridge	4	50c	4¼	50c	50c	1.60	50c	------	------	25c	25c	†1	75c
Silver Islet	21	16½	28	21	†15	22	17	13	19½	13	†5	13	5½

LAKE SUPERIOR COPPER MINING COMPANIES.—MONTHLY PRODUCT.—OFFICIAL.

Calumet and Hecla.						
Months.	1880-81.		1881-82.		1882-83.	
	Tons	Lbs.	Tons.	Lbs.	Tons.	Lbs.
May	1713	1528	1764	1019	1906	1610
June	1727	953	1763	898	1679	1840
July	1672	1099	1635	1817	1482	455
August	1701	1645	1818	339	1771	174
September	1684	881	1612	1437	1764	742
October	1750	822	1709	959	1724	1651
Six mos.	10,250	928	10,304	469	10,329	478
November	1655	1304	1652	173	*d*1717	1860
December	1703	1570	1734	252	----	----
January	1652	207	1691	1432	----	----
February	1435	1835	1713	1799	----	----
March	1710	1496	1908	707	----	----
April	1881	1797	1901	355	----	----
Year	20,290	1137	20,905	1187	----	----
Per cent	77.86		76.99		----	----
Ingot	15,797	1300	16,094	1985	----	----
Ingot, lbs.	31,595,300		32,189,985		----	----

Quincy.				
Months.	1881.		1882.	
	tons	lbs.	tons	lbs.
January	140	310	219	905
February	140	40	196	1655
March	140	610	195	35
April	142	1735	196	1215
May	150	1850	200	1225
June	160	1750	225	1870
Six mos.	875	295	1234	905
July	176	1255	225	70
August	225	45	275	955
Sept.	317	1250	325	250
October	413	1880	400	265
Nov.	884	1545	452	----
Dec.	514	1215	526	----
Year	3407	1485	3438	445
Per cent	83.73		----	----
Ingot	2853	606	----	----
Ingot, lbs.	5,706,606		----	----

Osceola.				
Months.	1881.		1882.	
	tons	lbs.	tons	lbs.
January	199	540	202	983
February	180	969	182	1849
March	201	1470	200	553
April	211	363	200	1962
May	208	1245	203	1533
June	196	1100	196	666
Six mos.	1197	843	1186	1546
July	197	580	200	768
August	202	1385	199	487
Sept.	191	374	197	1936
October	201	737	200	451
Nov.	207	1389	203	1495
Dec.	205	1330	215	Est.
Year	2403	638	2403	683
Per cent	87.13		87	
Ingot	2089	1976	2090	61
Ingot, lbs.	4,179,976		4,180,061	

Franklin.				
Months.	1881.		1882.	
	tons	lbs.	tons	lbs.
January	135	485	141	100
February	119	955	140	870
March	134	865	150	480
April	131	95	153	975
May	131	705	165	1615
June	134	465	169	350
Six mos.	785	1570	920	390
July	128	230	170	565
Aug.	130	1560	170	1440
Sept.	138	575	170	320
October	135	65	172	940
Nov.	140	680	180	1195
Dec.	150	190	204	500
Year	1608	870	1988	1350
Per cent	82.807		82.4	----
Ingot	1331	1764	1599	935
Ingot, lbs.	2,663,794		3,198,935	

Pewabic.				
Months.	1881.		1882.	
	tons	lbs.	tons	lbs.
January	80	460	103	310
February	66	450	98	1375
March	80	65	74	795
April	80	85	51	640
May	70	660	75	635
June	76	375	69	1995
Six mos.	453	95	472	1750
July	89	1650	53	385
August	92	1055	70	1005
Sept.	93	1150	74	670
October	104	1710	73	700
Nov.	151	1005	80	----
Dec.	135	145	71	----
Year	1120	810	895	510
Per cent	83.019		80.99	
Ingot	930	298	725	134
Ingot, lbs.	1,860,298		1,450,134	

Grand Portage.			Allouez.			
Months.	1882.		1881.		1882.	
	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
January	67	1079	82	650	83	870
February	40	560	65	60	84	1155
March	38	476	90	175	101	695
April	----	----	85	465	96	1030
May	----	----	90	310	104	965
June	----	----	92	45	101	265
Six mos.	146	115	504	1705	571	980
July	----	----	91	315	101	475
August	----	----	77	1580	101	340
Sept.	----	----	68	60	100	385
October	42	1300	65	1110	90	485
Nov.	42	960	81	1920	87	210
Dec.	----	----	80	1160	98	570
Year	*f*450	1100	969	1850	1449	1445

Atlantic.				
Months.	1881.		1882.	
	tons	lbs.	tons	lbs.
January	150	1190	152	355
February	150	685	150	150
March	150	1345	151	435
April	150	1310	150	300
May	150	1380	150	1390
June	145	1715	150	765
Six mos.	898	1625	904	1395
July	112	1630	150	665
August	157	853	151	101
Sept.	159	635	158	1425
October	158	953	161	1865
Nov.	162	995	175	104
Dec.	167	150	182	985
Year	1816	841	1884	540

Hancock.				
Months.	1881.		1882.	
	tons	lbs.	tons	lbs.
January	----	----	35	383
February	40	263	40	300
March	----	----	----	----
April	----	----	----	----
May	41	----	----	----
June	37	1849	----	----
Six mos.	119	112	----	----
July	37	1256	----	----
August	39	1800	----	----
Sept.	35	200	----	----
October	35	335	----	----
Nov.	41	400	----	----
Dec.	37	1123	----	----
Year	*f*345	1226	*f*417	----

Huron.				
Months.	1881.		1882.	
	tons	lbs.	tons	lbs.
January	----	----	12	835
February	46	675	12	1085
March	----	----	7	160
April	----	----	11	1345
May	27	1640	16	75
June	12	1200	18	1360
Six mos.	86	1515	78	860
July	9	1065	16	1295
August	9	393	25	714
Sept.	12	889	27	1595
October	11	1100	32	440
Nov.	10	508	27	5
Dec.	9	690	----	----
Year	149	160	*f*202	909

Mass.				
Months.	1881.		1882.	
	tons	lbs.	tons	lbs.
January	30	208	38	1945
February	----	----	----	----
March	25	147	----	----
April	10	1000	----	----
May	13	665	----	----
June	25	366	----	----
Six mos.	104	386	38	1945
July	----	----	----	----
August	----	----	52	230
Sept.	30	352	57	152
October	38	892	82	995
Nov.	31	1883	41	920
Dec.	37	120	----	----
Year	*f*241	1633	*f*523	1410

(*d*) November, 1882 not official.

(*f*) No further returns could be obtained from Treasurers of these companies.

INGOT COPPER.—MONTHLY LOWEST AND HIGHEST PRICES FOR A PERIOD OF 18 YEARS.

Years.	January.		February		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		Low	High	Av'ge
1865..........	46	**50½**	44	46	34	44½	34¼	35	30	34¼	28½	31	**28**	30⅛	30⅛	32	30⅞	32¾	32⅜	32¾	32⅞	45½	39¼	45½	28	50½	36 25
1866..........	38	**42**	35½	38	29½	35½	28⅝	30	28⅞	30⅞	30⅞	33⅛	31	33½	29⅞	31	30¾	32½	30¾	31	26¾	30¾	**26½**	29	26½	42	31.80
1867..........	27	**29¼**	27½	27⅝	24	27½	23½	24½	24	24¼	24	24½	24	26	25¾	26⅜	26⅜	27⅛	22¾	26¾	22¾	23	**21½**	22¾	21½	29¼	25.12
1868..........	**21½**	23½	22½	24	23⅛	24	23⅛	24⅜	24	24⅜	23⅛	24	23⅛	**24½**	24	24¼	23¾	24	23	24	22½	24	23¾	24½	21½	24½	23.62
1869......	23¾	26⅜	26	**27**	24	26¾	23¼	24	23¾	24¼	22	23¾	21⅞	22¼	21⅞	23⅛	22	23	22	22¾	22	22½	**21½**	22	21½	27	23.40
1870..........	21	21¾	20½	21¼	**19**	20½	19	19⅜	19	19⅛	19⅛	20½	20¼	20½	20	21	20¾	21½	21½	22	22	**22½**	22¼	22¼	19	22½	20.69
1871..........	22	22¼	21¾	22	21⅜	21¾	21⅜	21⅝	**21⅛**	21⅜	21⅛	21¾	21¾	22½	22½	23	23	23¾	23¼	23¾	23¼	25	25	**27¼**	21⅛	27¼	22.64
1872..........	**27¼**	28¼	28¼	28½	28½	37½	37½	**45**	33	40	32¾	34¼	33	33½	33½	33½	32⅞	33½	31½	32⅞	30⅞	32	31	33½	27¼	45	33.02
1873..........	33¼	**35**	34¼	35	34	34½	32½	34	29¾	32½	28¾	29¾	26¾	28¾	26⅞	27½	25	27	21⅝	25	**20**	24¼	24¼	24¾	20	35	28.97
1874..........	24½	**25**	24¼	25	24	24¾	24¾	25	24½	25	24	24¾	19¾	24	**19**	21	21	21¼	21¼	22¼	22¼	23¼	23¼	23¼	19	25	23.21
1875..........	**21½**	23¼	21½	22	21½	21½	21½	22½	22½	23	22½	23	22¾	23	23	**23½**	23¼	23½	23	23¼	23	23½	23¼	23½	21½	23½	22.70
1876..........	22¾	**23**	22½	22¾	22	22½	22	22¾	21	22	19¼	21	19½	20¼	**18¾**	19½	19	20¾	20	21	20	20¼	19¼	20½	18¾	23	20.91
1877..........	19¼	**20⅜**	19¼	20⅜	19¼	19½	19¼	19¼	19	19¼	19	19¼	18¼	19	17⅞	18⅞	17⅞	18½	17⅞	18½	17¾	17⅞	**17½**	17¾	17½	20⅜	18.80
1878..........	17⅜	**17⅝**	17	17½	16⅞	17	16⅞	17	16⅜	16¾	16¼	16⅜	16⅛	16¼	16	16⅛	15⅞	16⅛	**15¼**	15⅞	15½	16	15¾	16	15½	17⅝	16.42
1879..........	15⅜	16	15½	15½	15½	16	15⅞	16	15⅞	16¼	16⅛	16¼	16⅛	16¼	16⅛	16⅜	16¼	18¾	19	21½	21	21¾	21⅛	21½	15⅜	21¾	17.35
1880..........	21¼	24⅞	23¾	24	22	24	20¾	21¾	18	20½	18	19	18⅝	19	18⅞	19	18¾	19	18⅝	19	18⅝	19	18⅞	19⅛	18	24⅞	20.18
1881..........	19⅛	19⅜	19¼	19⅜	19	19¼	18¾	19	18	18¾	16¼	18	**16**	16½	16½	17	17	18¼	18	18¼	18	19⅜	19¼	**20¼**	16	20¼	18.27
1882..........	19½	**20½**	18¾	19½	18½	19¼	**17⅞**	18½	18⅛	18¼	18⅛	18¼	18⅛	18¼	18⅛	18¼	**17⅞**	18⅛	18	18⅛	18	18	**17⅞**	18	17⅞	20½	18.41

SLATE.

SLATE.

QUARRIES AND DOCKS ON HURON BAY, LAKE SUPERIOR, MICH.

Very many men who are quite familiar with the State industries have examined the quarries at Huron Bay, and pronounce the quality of the slate and the extent of the deposits equal to any to be found in the country. The product has been submitted to leading architects in Chicago, New York, and elsewhere, and the testimony has been, unanimously, strongly in its favor.

The present company, organized to work these deposits and furnish slate for the market, was formed in 1881 by Messrs. W. D. Thompson, Jackson, Mich., C. R. Knickerbocker, do; Edwards, Townsend & Co., Cleveland, and S. L. Smith, S. F. Seager, and James Turner, of Lansing, Mich.; the capital stock fully paid up is $500,000. The company acquired the title of the lands, etc., formerly owned by the Huron Bay Slate and Iron Co., the Superior Slate and Mining Co., and the Clinton Slate and Iron Co., with other lands esteemed of value to the interests of the company.

In the commissioner's report for 1878, a description of the deposits is given, together with a history of each of the companies that had been formed and a statement of the work done, etc. There was nothing further to add, up to the time of the formation of the present company; since the time of the writing alluded to, to the period of the resumption of operations by the present company, all work had been suspended.

The owners have exemplified their faith in the value of the property by extensive improvements, which they have made and are still making, and the opening of new quarries.

Work was begun in July, 1881, and from that time until March thereafter the time was occupied in rebuilding the railroad five miles, from the location to the bay, repairing the docks, clearing land, building a stone engine house and supplying it with machinery, building a blacksmith's shop, carpenter shop, 14 new dwelling houses, a barn 100x40 feet, wagon shop 60x30 feet, a boarding house and hotel, 153 feet in length, 2 stories high, which latter building cost with an attached refrigerator $10,000.

Having performed this preliminary work, the company, on the first of March, began to open a new quarry; having decided to abandon the old pits, they commenced at a distance of 100 feet south from the Clinton quarry to uncover the ledge, sink a pit, and to drift from it to the north to connect with the Clinton. This work is still in progress, and when accomplished the company will have an opening 200 feet in length across the slate formation, and in depth to the bottom of the shaft, which is already sunk, sixty-five feet.

All the developments which have been made tend to confirm the statements made in the report of 1878, regarding the geological formations of the slate deposits. The facts as to cleavage, dip, bedding, etc., are still shown to be as therein indicated; by reference to the diagram and text of that report the rock structure will be clearly understood. "The slate formation in these quarries forms a wide belt and extends over a portion of the Huron Mountains." "It consists of several strata, or narrow beds of good slate rock; the cleavage or splitting planes of the slate dip very uniformly to the south, but the natural bedding is in broad anticlinal and synclinal waves, which have a trend nearly east and west, and a consequent dip to the south or to the north as the case may be; the bedding planes are very plain and can be readily determined by the experienced observer; nevertheless an expensive error was made at one of the quarries when it was opened, by mistaking the cleavage for the bedding."

One hundred and fifty rods to the west of the Clinton opening, another, called the Bismark, was started in the latter part of the summer of 1882, and the work in it was continued until the winter set in. Mr. Litchfield, the superintendent, states that the result of this development was of the most promising character. To use a mining phrase, he says they struck the mother belt of the slate formation. In quality the slate they have here obtained is the best; it splits freely, is a shade lighter than the Clinton product, and from present indications there is a large quantity of it. They have explored the belt to the north and to the east for 200 feet from its first opening by sinking in it, and find it to be at each of these points the same. The depth to which it has been proved is 15 feet, and there have been no indications of poor rock. Some other openings have been started, but in none of them has much progress been made.

From the commencement of work to the present time the company has employed an average force of 95 men, and have paid average wages of $2.00 per day. The purpose has been to get ready for a large annual output in the future. Thus far the present company have not made any effort to manufacture slate, but it is expected that the coming season they will turn out 40 or 50 squares per day, and thus be prepared to meet all demands for purchase. In quality the slate is of the best, fully equal to any eastern slate for roofing purposes, and can also be used for any of the purposes for which the slates of Vermont and Pennsylvania are noted. The company has expended thus far in the work a quarter of a million of dollars, exclusive of the cost of the property. The greater portion of this expenditure has been for surface plant; especially for the railroad, which has been laid with steel rails, and will be operated with a locomotive at the opening of spring—1883. The quarries are in T. 51 N., R. 31 W., in S. W. ¼ of S. E. ¼ of Sec. 28, and the Old Clinton quarry is in the N. W. ¼ of Sec. 33. The elevation is 500 feet above Huron Bay, and the distance from it about five miles, and it is 16 miles from L'Anse, to which place a highway has been made. The company have ample docks at the terminus of the railroad at the bay, in sufficiently deep water for the largest vessels to enter. It would seem that the slate interest of Huron Bay was now upon a secure basis, and that it should thenceforward be one of the permanent and prosperous mineral industries of the State. The superintendent, Mr. N. A. Litchfield, is a gentleman of large experience in the slate quarrying business, and expresses full confidence in the future of the quarries which he is now engaged in developing.

The following regarding the slate industries is clipped from the Portage Lake Mining Gazette:

LAKE SUPERIOR'S SLATE DEPOSITS IGNORED.

The value of the slate beds of this region for roofing and other purposes is no longer a matter of doubt, but so far the development of the material, which exists in abundance in Baraga county, within a short distance of shipment by lake, has not been carried on with the business enterprise which its commercial worth suggests. The day is coming, however, when the slate deposits down there will command the attention they deserve, and furnish an important line of prosperous industries.

To show how little is known outside concerning the slate beds of Lake Superior, we give below an interesting article on slate from the Boston Commercial Bulletin, which ignores this section as the possessor of this mineral:

The better class dwelling-houses in large cities and the immediate suburbs have, for a long time past, been roofed with slates, and in the country their use is constantly growing larger. The first cost of slates is more than that of shingles, but they are cheaper in the end, as they will last as long as the nails will hold them, and will always afford a better protection to the roof. Some country people who use rain water also prefer them because the water when it comes from them is perfectly clean. Slates are particularly adapted for use on the Queen Anne style of houses on which shingles have been almost entirely used. The shingles have to be painted, and the paint will wear off and the shingles become discolored and warped, while different colored slates may be used, and will form a permanently handsome covering, and one which will last for an indefinite period. On city warehouses slates are not now very much used, as the roofs are generally flat, but they are used ornamentally in many ways on city buildings, and their use is almost universal on public buildings, churches, railroad depots, and such structures. Slates are also used generally on founderies and furnaces, where they are valuable as a protection against sparks, and their use on manufacturing buildings generally is growing.

AMERICAN SLATE QUARRIES.

The great slate producing section of this country is Pennsylvania, which, by reason of the extensive deposits and ability to manufacture cheaply, as well as accessibility to the western markets, is enabled to control the slate trade. The Pennsylvania slate is black and unfading. In and around Fairhaven, Poultney and Castleton, Vermont, and Hampton, Middle Granville, Salem and Pawlet, New York, are produced the fancy colored slates used for ornamental purposes, such as the unfading green and red, and thereabouts also, particularly in Vermont, are produced the sea green, purple, and black slates, which are not unfading. There are also mines at Monson and Brownville and in Kennebec county, Maine, which yield black slate. These Maine slates combine unfading color with all the desirable qualities of slate, and are regarded by the trade as one of the best slates in the market. These slates are all about the same price in the Boston market, as the difference in freight generally almost equalizes the price.

THE TRADE.

The slate trade is extremely sensitive to the financial condition of the country, and is one of the first industries to feel the effects of any business depression, and one of the last to recover from it. During the "panic" years the trade was prostrated, but since 1879 it has shown a steady and marked improvement.

The amount manufactured in the United States during the last four years, a square being equal to 100 square feet, was as follows:

	Squares.
1879	367,000
1880	382,000
1881	554,000
1882	501,000

The amount produced in the various sections during 1882 was as follows:

	Squares.
Pennsylvania	328,000
Maine	43,000
Vermont	120,000
Virginia	10,000

FOREIGN SLATE.

Wales may be regarded, for all practicable purposes, as the great slate producing country, outside of the United States, though there are some quarries in Cornwall, Scotland, Ireland, and on the Continent of Europe. Welsh slate was formly imported in considerable quantities, but the Americans now not only control their own markets but also export heavily to South Africa, New Zealand, and Australia, as well as the various European countries.

The exports for the past four years have been as follows:

	Pieces.
1879	1,100,000
1880	1,900,000
1881	4,400,000
1882	5,800,000

The slate exported has been principally low class slate, and since the beginning of this year the exports have been light. This has been due to unfavorable local causes in the various countries and the competition of Welsh slate.

PRICES.

There is generally very little doing in slate during the winter, and the trade opens in March and closes in December. As may be judged by our figures, the trade last year was a good one, and prices in the Boston market advanced about 50 cents per square. The trade this season is entirely dependent upon the general condition of the country. At present all slates are cut and prepared by machinery by which better slates are made than by hand. An interesting fact in connection with the trade is that nearly all the quarries are worked by Welshmen, who seem to believe that they have a heaven-given faculty for working slate.

GYPSUM.

GYPSUM.

I do not find much of general importance to add to what is very fully given in the commissioners' report for 1881, regarding the plaster business at Grand Rapids. The past year has been a prosperous one and shows an increased output.

The rivalry which formerly existed among the several companies resulting in the cutting of prices below living rates, has been done away with. The entire plaster and stucco manufacturing interests of the State are now pooled, and each company is allowed its share of the business. This arrangement was consummated early in the year 1882, and the sales of the past year now made on this basis through a central office, and the same plan will be continued. The only exception to it is the Alabastine company, of Grand Rapids, which is opening a quarry on some leased lands lying south from Godfrey & Bro.'s mills, being near the east line of the city limits, on the line of the Chicago & West Michigan railroad. This company has built a new mill for the manufacture of stucco, furnished with one 8-foot kettle, six tons capacity, that is one that will turn out six tons at each boiling. A second kettle will be added, and it is estimated that the mill will turn out 40 tons per day of calcined plaster.

The quarry is opened and they have 5,000 tons of rock in stock. Twelve feet of dirt were removed, which is succeeded by 12 feet of plaster rock; a boring which was made revealed a second underlying stratum of the same material. This is the only company whose product is not pooled; they have contracted with the State Grange to furnish 8,000 tons, at $2½ per ton delivered on the cars. The agency price of land plaster is placed at $3 per ton. The stucco made will be for the company's own use in the manufacture of alabastine; 1,500 tons were used last year for this purpose, and about 2,000 the present year, 1883, will be required.

Messrs. Godfrey & Bro. are improving their water power, by raising the dam to the height of 18½ feet, making it flow 25 acres. It is expected that this will give sufficient power for their entire business.

The product of the different companies for the year 1882 has been as follows:

NAME OF COMPANY.	Land Plaster. Net tons.	Stucco, barrels 300 lbs to a bbl.
Grand Rapids Co.	7,512	32,854
Godfrey & Bro.	6,080	30,274
Noble & Co.	6,037	27,993
Union Mills Plaster Co.	8,298	23,074
Loren Day	6,901	9,643
B. F. Smith	2,993	11,817
Total	37,821	135,655

TABLE Showing the Amount of Land Plaster and of Calcined Plaster, produced in Michigan, for each year since 1866, and previous years:

YEARS.	Land Plaster, Tons.	Stucco—Barrels, 300 lbs. each.
For years previous to 1866	†100,000	* 80,000
1866	14,604	....
1867	17,439	....
1868	28,837	34,966
1869	29,996	41,187
1870	31,437	46,179
1871	41.126	48.685
1872	43,536	59,767
1873	44,972	82,453
1874	39,126	82.449
1875	27,019	61,120
1876	39,131	64.386
1877	†40,000	†55,000
1878	†40.000	48,346
1879	43,658	50,800
1880	49,570	106,004
1881	33,178	112,813
1882	37,821	135,655
Total	701,450	1,033,810

†Partly estimated. *Stucco for years previous to 1868.

TABLE Showing the Amount of Land and Calcined Plaster produced by the several Plaster Companies in Michigan for the years given.

NAME OF COMPANY.	Tons of Land Plaster.				Barrels of Stucco.			
	1879.	1880.	1881.	1882.	1879.	1880.	1881.	1882.
[1] Godfrey & Bro.	9,117	9,000	6,422	6,080	......	23.000	27,500	30,274
[1] Grand Rapids Plaster Co.	8,970	12,000	6,375	7,512	......	23,500	20,400	32,854
[1] Geo. H. White & Co.	1,900	......	......	......	......	......	......	......
[2] Wyoming Mills Co.	7,000	10,000	6,093	6,801	......	......	......	9,643
[2] Union Mills Co.	4,500	7,500	6,716	8,298	......	35,000	34,913	23,074
[1] Taylor & McRingolds*	10,585	9,570	6,572	6.037	......	24,504	30,000	27,893
[3] Smith, Bullard & Co.	1,586	1,500	1,000	2,993	......	......	......	11,817
Total	43,658	49,570	33,178	37,721	......	106,004	112,813	135,555

[1] Quarry, etc., at Grand Rapids. [2] Quarry, etc., at Grandville. [3] Quarry at Alabaster

* Now D. Noble & Co.

COAL MINES.

COAL MINES.

The coal mines of Michigan were fully written up in the last report, and on visiting the mines I am able to find but little, beyond that which has already been stated, to give regarding this mineral interest. During the summer of 1882 the mines were all idle through an extensive strike by the workmen. This strike continued from July to September, and as a matter of course greatly reduced the product of the mines. Miners at Corunna now receive $1.15 per ton for mining, and at the Jackson mines 90 cents per ton, in addition to $3 per foot paid for driving the openings, 6x5 feet. One man can mine from 1½ to 2½ tons per day. The reason that a higher price is paid at Corunna for mining is due to the fact that the work is more difficult, the coal is harder, or claimed to be.

The Corunna Coal company abandoned the old bank in May last, and the work is now all confined to the new mine, which at the date of the last report had just been opened. They have not experienced the best of luck; were of course idle during the strike; the men at that time were receiving $1.10 per ton, and claimed an advance which the company refused to allow; ultimately the company got an advance of five cents per ton on the price of coal and gave the men the benefit of it. After the strike was adjusted and work was resumed, the water broke in and flooded the mine, and then a fire consumed the "dry" in December. They have difficulty in keeping the men; the company has imported seventy from Ohio, the past year, paying all their expenses, but they have only ten of these men now. It is hard work and requires experience to mine coal in these banks; the coal has to be blasted (at Jackson blasts are not necessary), and each man must be his own boss, in a measure have his own "room." He must know just how strong a blast to put in to throw out a full amount; if the blast is too light or not well placed, it will only shake the ground, and then it must be all picked out, as a second blast in the same hole would only dissipate itself in the seams. The man looks after himself and receives $1.15 per ton. It takes some experience and skill on the part of the workman. They use a sledge of 8 pounds weight.

The shaft is vertical, 8x16, and 67 feet in depth, and divided. The main entrance, drift from the bottom, is driven east 529 feet from the shaft; the "butt entries" turn from this at right angles, and from these latter the "rooms" are cut out. The "butt entries" are driven at each 100 yards, or would be if the ground were horizontal, but as the shaft is sunk in the lowest point and the vein descends toward it from the east, these lateral drifts are cut at 40 yards apart and from these the ground is worked only in the up-hill direction, so that the product, as does the water, runs down hill; the latter collects into the sump at the shaft.

To the west of the shaft the work has been abandoned, the ground is unsettled and broken, but east the roof is firm; it is a fine grained, black, silicious slate; when brought to the surface and exposed to the air it disintegrates.

The coal sells readily at nearly the same price as does the Ohio coal at Detroit. The only difference in price being the transportation from Detroit. Owing to the strike, etc., and the considerable outlay in opening the new mine, the expenditures have exceeded the income by $25,000.

The prospects are very good for the coming year. The vein is 3 to 4 feet thick and very uniform, but the price is low. The thicker coal veins in Ohio can be mined at a much less relative cost per ton, enough less to cover the cost of transportation, so that the Ohio coal is shipped in and sold in Detroit for less than the Michigan mines can afford to sell it.

The product for the year 1882 of the Corunna mine is monthly as follows:

	Pounds.		Pounds.
January	-------	July	2,658,400
February	255,300	August	1,082,400
March	250,506	September	639,700
April	822,200	October	2,156,400
May	1,138,000	November	2,643,200
June	2.351,000	December	2,750,000

Total 8,623¾ net tons.

PRODUCT.

	Tons.
1878	22,537
1879	26,215
1880	12,252
1881	7,000
1882	8,623

George Tod, President, Youngstown, Ohio. Tod Kincaid, Agent, Corunna, Michigan.

JACKSON COAL MINES.

The coal mines about Jackson constitute an important part of the business interests of that city, and with the exception of the Corunna mines, a very little which is done at Grand Ledge, at Flushing, and at Williamston, comprises all the coal mining done in the State. These mines were described in the last report, and although I have again visited them, I do not deem it worth while to undertake a new description, and will merely give such statistics as I have obtained that are of any particular public interest.

THE MICHIGAN COAL COMPANY.

Office in Jackson, Mich. Z. C. Allard, Treasurer, Thomas A. Willard, Secretary, J. C. Eldred, Agent, Donald McGorry, President, Cleveland, Ohio.

The company employs 105 men altogether, 85 of whom are miners. The miners work on contract, and receive 33 cents per car load equal to $1 per ton, an increase above the price paid. The men furnish their own tools and lights, and push the cars to the main track. It is claimed that there is some improvement in the width of the vein, giving it an average thickness of 4 feet. The prices at which the coal sells are, for slack coal $1.25 per ton, unscreened $2, other varieties at the shaft $2.50 to $4.25 per ton, retail. The product for the year 1882 was 25,000 net tons. The shaft is vertical, 80 feet deep. The location is on the north side of the Michigan Central railroad, about four miles east from the city. The company hold the mineral right to 500 acres, and the fee simple of a small parcel of land in which the shaft is sunk.

In 1880 the company mined 20,021 tons, in 1881 23,987 tons, and in 1882 25,000 tons, total 70,008 tons.

THE SLOPE MINE,

Owned and worked by the Jackson Coal Company, is the largest producing coal mine in the State; its product for the year 1882 was 60,103 net tons. One hundred and fifty men are employed in and about the mine. The shaft is 300 feet long and reaches to a point 100 feet below the surface. The average thickness of the coal seam is 3½ feet.

R. H. Emerson & Co., Agents, C. H. Bennet, Treasurer, Jackson, Mich.

EUREKA COAL COMPANY.

M. S. Hitchcock, Treasurer, Jackson, Mich.

This mine is about one mile northwest from the Slope mine. It is opened by a vertical shaft 53 feet deep, and the company holds the mineral right to one hundred and five acres of land. The coal seam in which the company is mining is about 3½ feet thick, and the underground workings extend over an area of 30 acres. The product has been, 1880 30,000 tons, 1881 37,477 tons (net), 1882 , total . The royalty paid is 15 cents per ton screened coal.

THE PORTER COAL COMPANY.

This company is now operating the old Woodville mine, which was unwatered a little over a year ago, and mining work in it resumed, resulting in a product for the year 1882 of 6,158 net tons. Office, Jackson, Mich. Benj. Porter, Secretary, Isaac Hurd, Treasurer and General Manager.

THE SOUTH MINE

Is the name given to an exploration which has recently been made, resulting so favorably that the organization of a company to work the shaft is contemplated. They sunk 34 feet, cutting a 4-foot vein of coal, in which they drifted 250 feet. The roof is black slate, apparently firm and sufficient for a support. W. A. Hammond, Secretary, Jackson, Mich.

WILLIAMSTON COAL COMPANY.

Coal has been mined in a limited way at Williamston for many years. R. H. Emerson & Co. unwatered an old shaft at that place a year ago, and have kept a force of about 20 men at work there during the year, resulting in raising 10,454 net tons of coal. The vein averages about 3 feet thick, but the water is so troublesome, with the unfavorable circumstances, the company talks of shutting down. C. H. Bennet, Treasurer, Jackson, Mich.

GRAND LEDGE.

Two or three miners have worked getting out coal at this point for local consumption. A small amount of coal has been mined here off and on for years, but no extended work has ever been undertaken.

TABLE Showing the Amount of Coal Produced in Michigan for 1877-78-79-80-81-82, Total for Previous Years Partly Estimated.

	Yr's previous to 1877.	1877.	1878.	1879.	1880.	1881.	1882.
Williamston Coal Co	....	....	....	....	....	....	10,454
Jackson mines	....	67,697	61,785	65,000	....	....	....
Corunna mines	....	....	22,537	16,215	....	....	....
Other mines	....	1,500	1,000	800	....	....	....
Slope Mine (Jackson Coal Co.)	....	....	....	....	66,780	61,666	60,103
Eureka Mine (Jackson)	....	....	....	....	30,000	37,477	....
Michigan Coal Co. (Jackson)	....	....	....	....	20,021	23,987	25,000
Corunna Coal Co. (Corunna)	....	....	....	....	12,252	7,000	8,624
Other localities	....	....	....	....	1,000	2,000	....
Porter Coal Co. (Jackson)	....	....	....	....	....	....	6,158
Total net tons	350,000	69,197	77,715	82,015	130,053	132,130	....

SALT.

SALT.

It is well known that Michigan has become a large salt producer, and from the excellent report of the late salt inspector I am mainly indebted for the following facts regarding the business:

The first practical attempt at salt well boring was made in Grand Rapids in 1859; the depth attained was 275 feet; an analysis of the brine seems to have shown but a small percentage of salt. The first well at East Saginaw was made in 1860, and an analysis of the brine gave 19 parts to the hundred of salt.

Experience has shown that the best quality of salt can be made from Michigan brines, and that the great preponderance of the salt sold in the market has been found as pure and as efficient an antiseptic as any mined or manufactured elsewhere, within this or in foreign countries. To preserve the reputation of our salt and to protect honest manufacturers the legislature, by statute, established the office of State Salt Inspector, and provided for a

SYSTEM OF INSPECTION.

The irregularities that crept into the manufacture of salt, deteriorating its quality and value, soon made it evident that some system of inspection would have to be adopted to protect the careful manufacturer against the ignorance and carelessness of others.

As early as the year 1865 a system of local inspection was adopted by a number of salt manufacturers which had a tendency to improve a portion of the salt product. The inspection, however, not being a general one, and there being no State law by which offenders could be punished, the effectiveness of the inspection was greatly diminished, and it soon became evident that some more stringent system, backed by a State law, would be the only way to secure uniformity of manufacture.

To meet this point a committee of the then existing Saginaw and Bay Salt Association was appointed in 1868 to draft a law meeting the wants of the salt manufacturers. The law as perfected by the Association was presented at the next session of the State Legislature and passed by them—approved March 6th, 1869, and amended by an act approved April 16th, 1875. Dr. Samuel S. Garrigues received, at the hand of of Gov. H. P. Baldwin, the appointment of State Salt Inspector on the 17th of March, 1869, was re-appointed by Gov. Bagley in 1875, and has just completed his second term of office, having filled for twelve years with much wisdom and fidelity a position which has enabled him greatly to advance improved methods of manufacture and to place Michigan salt on a firm footing in the market. Dr. Garrigues will in the future act as chemist to the Salt Association, and Geo. W. Hill has been recently appointed by Gov. D. H. Jerome to act as State Salt Inspector.

AN ACT TO REGULATE THE MANUFACTURE AND PROVIDE FOR THE INSPECTION OF SALT.

SECTION 1. *The People of the State of Michigan enact,* That no salt manufactured in this State after this act takes effect shall be sold within the State, nor exported therefrom, until the same shall first be duly inspected, as provided in this act. Any person who shall violate the provisions of this section shall pay for the use of the people of this State, as a fine, the sum of twenty cents for each bushel of salt sold or exported, contrary to the provisions of this act. In case any manufacturer of salt shall knowingly sell, or export, or permit to be sold or exported, salt, contrary to the provisions of this act, he shall, on conviction thereof, be liable to a fine not exceeding one thousand dollars, or imprisonment in the county jail not exceeding ninety days: *Provided,* That nothing in this act shall apply to any salt packed and in the hands of dealers when this act takes effect.

This section is followed by 42 others, covering the whole business of the manufacture and sale of salt and the duties of the inspector.

Michigan is now the largest salt producing region in the United States, its only competitor to any extent is Onondaga, which latter it largely leads in production.

There are 260 salt wells in the State, 226 of which are in the counties of Saginaw and Bay, the remainder, 34, are in Huron, Iosco, Manistee, Midland, Gratiot, St. Clair, and Jackson counties. The average depth of the wells in the Saginaw valley is 950 feet, in Manistee to 1,900 feet. The average Salometer strength is 90° at 56° Fahrenheit.

The following table shows the amount of the various grades of salt inspected in Michigan since 1869, the first year of the establishment of the State Salt Inspection:

Years.	GRADES OF SALT IN BARRELS.				Total for each year in Barrels.
	Fine.	Packers.	Solar.	Second quality.	
1869	513,989	12,918	15,264	19,117	560,818
1870	568,326	17,869	15,507	19,650	621,350
1871	655,923	14,677	37,645	19,930	728,175
1872	672,034	11,110	21,461	19,876	724,481
1873	746,702	23,671	32,267	20,706	823,346
1874	960,757	20,090	29,391	16,741	1,028,979
1875	1,027,886	10,233	24,336	19,410	1,081,865
1876	1,402,410	14,233	24,418	21,668	1,462,729
1877	1,590,841	20,389	22,949	26,818	1,960,997
1878	1,770,361	19,367	33,541	32,615	1,855,884
1879	1,997,350	15,441	18,020	27,029	2,058,040
1880	2,598,037	16,691	22,237	48,623	2,676,588
1881	2,673,910	13,885	9,683	52,821	2,750,299
1882	2,928,552	17,208	31,335	60,222	3,037,317

Previously to 1869 the salt production of the State was as follows:

Years.	No. of Bbls.	Years.	No. of Bbls.
1860	4,000	1865	477,200
1861	125,000	1866	407,077
1862	243,000	1867	474,721
1863	466,356	1868	555,690
1864	529,073		

The average price which Michigan salt sold for per barrel in different years is as follows:

Year.	Price.	Year.	Price.
1866	$1 80	1875	$1 10
1867	1 77	1876	1 05
1868	1 85	1877	85
1869	1 58	1878	85
1870	1 32	1879	1 02
1871	1 46	1880	75
1872	1 46	1881	85
1873	1 37	1882	75
1874	1 19		

GRINDSTONES.

GRINDSTONES.

WHERE THEY COME FROM AND WHERE THEY ARE MADE.

Up on the shores of Lake Huron, at the extreme end of the "thumb" of Michigan's lower peninsula, and 90 miles north of Port Huron, is located Grindstone City. It is an enterprising town of 1,500 inhabitants, and takes its name from the fact of its location on the most extensive grindstone quarries known in America. These strata stretch away in a most limitless extent, containing stone sufficient to supply the world with this important article for centuries. The Lake Huron quarries, as they are called, were first worked in 1838, and have been under the present management since 1840. About 3,000 tons are annually taken out, and yet it is estimated that less than one per cent of the whole amount has been removed. The stone extends from near the surface to a depth of about 16 feet, and lies in nearly horozontal strata which vary from a few inches to two feet in thickness. That nearest the surface is a trifle softer than the rest. The features of this stone are a hard, fine grit, and the absence of all foreign substances, which specially adapt it for cutlery and sharp edge tools. It is quarried by having the strata broken up with bars to the required sizes, no blasting whatever being done. When first taken from the ground the stone is soft and easily broken, but a few days exposure to the sun evaporates the "sap" and fits the stone for use.

Grindstones are made by first chipping the block as nearly as possible to the size of the intended stone, after which it is "hung" and turned to the requisite thickness and diameter. This work is done in mills near the quarries, and from which the stones are sent by water to the company's agencies at Detroit, Chicago, and New York. The company employs about 100 men eight months in the year, work being suspended during cold weather. The company ships its goods to all parts of the United States, to European countries, and to Australia. In 1871 James Wallace, one of the members of the firm, built one of the finest residences to be found in Detroit, at 990 Woodward avenue, entirely of grindstone material.

The only other sandstone quarries in America which produce an article suitable for grindstones are in Nova Scotia and at Berea and Marietta, Ohio. Those at the latter place, also owned by the Lake Huron company, produce a soft inferior stone, in demand only for purposes of dry grinding. The grit is very coarse and the stone soft, and therefore suitable only for heavy work. The fine Lake Huron stones are usually made small, while most of the coarse Ohio stones are cut large. The largest are 12 inches thick, 7½ feet in diameter, and weigh from 4,000 to 4,500 pounds. They are used alone in Detroit by W.

C. Bennett & Co., at their knife works on Brush street, near Woodbridge. Bennett & Co. keep four of them in motion in their extensive works, and, notwithstanding the immense size of the stones, they are each ground entirely away in from 30 to 40 days. All grindstones are sold outright by the manufacturers, no commission agents being employed, and the price per pound is uniform, whether the stones are large or small.—*From Detroit Daily News.*

THE IRON MINES.

MARQUETTE RANGE.

CLEVELAND IRON MINING COMPANY.—(APRIL, 1883.)

The early history of this mine, as a part of the discovery and settlement in the iron region, is briefly given in that connection in the historical sketch at the beginning of this volume. It is one of the most favorably known as well as one of the oldest of the mines in the State. Its affairs have alway been consistently and ably managed, and the business of the company has ever been constantly and uniformly successful. The history of the Cleveland mine is not characterized by the ups and downs, to the extent so frequently found in the record of many important mining companies. The company's estate comprising upwards of 2,000 acres of land is in one body, in a compact form ; the western portion is covered in part by the city of Ishpeming, and it extends east to the Jackson company's property, or nearly to the city of Negaunee.

The principal mines of the company are within the limits of Ishpeming, and the fine new stone buildings recently erected by the company and the great activity prevailing about the location are among the attractive features of the busy little city. In the past year the company has made some important improvements, which being upon the surface are very noticeable. These are new machine and carpenter shops, built of stone with iron roof, and located on the north margin of the street leading in the direction of Negaunee, the enlargement of the main engine house situated opposite the former, the grading down of the road that runs by it, the enlargement of the office, the removal of several old buildings and superflous ore docks, and many other minor changes that have added materially to the attractiveness of the location and hence to this portion of the city. The front of the new machine shop, along the street, is 147 feet in length, east and west, by 44 feet in depth, north and south, and the wing of the same length, which extends from the center of the main part north is 62 feet in length by 44 feet wide. It is very substantial and when fully completed and provided with the machinery that will be placed in it, it will be adequate to all future needs of the mine. The machinery will be run by a Westinhouse engine which has already been erected within the building. In the easterly extension of the main engine house, which is also of stone with iron roof, built in the most durable manner, and in entire architectural conformity with the rest of the building, have been placed the new hoisting machinery, for the holding of which the enlargement was made. This comprises four Lane winding drums, each eight feet in diameter, and a second double compressor to duplicate the one already in use in the same building.

There are now upon the location three of these stone buildings, the two already mentioned and the pumping engine house, built the previous year. The result is not only an agreeable one to the eye, but the business of the mine will be concentrated and cheapened thereby.

For several years past the Cleveland company have conducted systematic and extended explorations with the diamond drill, and the result has been, in the aggregate, a very valuable one; it has developed the existence of bodies of ore, yet untouched, of sufficient magnitude to be a surety for a long future of prosperity.

One of these bodies of ore, which was discovered by the diamond drill, has just been reached by two vertical shafts, known as "K" and "J" shafts, situated at some distance from the old mine, and on the south side of the main line of the Marquette, Houghton and Ontonagon Railroad. The latter of these is now 260 feet in depth, of sufficient size for a double cage. The diamond drill passed through 52 feet of ore in this shaft, but in what direction the deposit may lay remains to be determined. From the bottom, a drift 12 feet in length to the north came to the rock, and a boring from the end of it in the same direction 90 feet, was all the distance in dioritic schist, but to the south they have a hundred feet of ore. "K" shaft is vertical 80 feet in depth, to the ore, and thence the working follows the ore, inclining downwards towards the bottom of "J" shaft. The connection of the two is sought for the purpose of ventilation, and will be accomplished in about six or eight months further. In the meantime these shafts are furnishing a daily product, at the present time, of 60 tons of ore.

In No. 3 pit next to the New York line—the north part of the mine—the stopes are reduced to one; the line cuts off the mine on the north, and to the west the hanging wall has come down and cut off the ore in that direction; but this, while a matter of temporary inconvenience, is no cause for alarm, since it is known from the borings that have been made that the body of ore again recurs beyond this wall of rock, to the west. The necessity is made of pushing through it in the direction of what is known as "B" shaft, where 60 feet of ore was passed through by the diamond drill. Also the workings of the New York mine along this line, further to the west, show that ore there extends into the Cleveland property; they have mined to it along the line on the New York side.

This ore will perhaps be reached from the further extension of No. 2 pit, which adjoins No. 3 on the south and opens into it, but does not reach so far west. No. 2 skip has for the past year been pushing downward and westerly through rock, and will soon be in ore, as is known by a boring which has been made from the end of the pit. So that the future of this part of the mine is well assured. While under a temporary cloud it is certain to be again as productive as ever, and probably so even in a greater degree than at any period heretofore.

As formerly, the well known Incline pit, still continues to be the main productive part of the mine. By far the largest portion of the product comes from this pit, and there is no indication of an abatement in its yield; the stopes are large and in sufficient number, and the sinking, which is in progress for further openings, is equally promising. The daily product of this pit is now 400 tons. It has been extended west during the past year in the north part of the pit 200 feet, and the south part 140 feet, measured horizontally,—the average westerly dip being, perhaps, 17° from the horizontal. The west end of the pit is 190 feet below datum. In this portion, embraced in the past year's work, four large ore pillars have been left to support the roof. A large ore pocket has recently been built in this pit in the line of No. 4 double skip road, to which the ore is trammed from the upper stopes. The skips are filled from the shutes in this pocket. The extension of No. 3 pit west during the year past has been 150 feet.

A few men are working in the Sawmill pit, and the product is about 1,500 tons per month. Diamond drill borings made from this pit showed large bodies of ore in advance of the openings, which it has not yet been sought to reach.

The Hematite mine, situated a mile to the north, is looking extremely well. It is now worked entirely underground from two shafts. No. 4, the easterly one, is 237 feet deep, and No. 3, which is 375 feet to the southwest from it, is 201 feet deep. Both are vertical, and are worked with bucket and derrick. The shafts are connected by the open chambers and long drifts. Both are designedly sunk in rock a short distance from the ore. They are working only in No. 4 just at this writing, No. 3 being stopped by a temporary influx of water, which must first be got rid of before work can be resumed. From No. 4 they are hoisting 100 tons per day. In the level in which they are now working they have drifted west 120 feet, and are in a body of ore 30 feet wide, and are sinking to prove the depth of it. The sinking has progressed to a depth of 30 feet, and will continue. The ore lense at No. 4 runs east and west; at No. 3 it runs north and south, and was in the level 40 feet above the bottom 156 feet long. In the bottom level they had drifted 80 feet when the water broke in; it is 20 to 30 feet wide. The drifts are timbered, but the ore deposits being under the open pits are allowed to fill with dirt as fast as worked out,—the ore is worked out and the dirt drops down from above.

A new engine house has been buit, situated 150 feet south of No. 4 shaft, and a new plant of hoisting machinery will be placed in it. The mine yielded in 1882, 24,000 tons of ore, and the estimated product for 1883 is 30,000 tons, 8,000 tons of which are now in stock. This mine is in what is known as the Teal Lake range, being in the line of the Cambria, Bessemer, Detroit, etc.,—all lying west from Teal Lake.

The product of the Cleveland is as follows:

Years.	Tons.	Years.	Tons.
1854	3,000	1869	106,133
1855	1,444	1870	132,884
1856	6,343	1871	142,658
1857	13,201	1872	151,724
1858	7,909	1873	133,265
1859	15,787	1874	105,855
1860	40,091	1875	129,881
1861	11,795	1876	145,661
1862	40,364	1877	151,554
1863	46,842	1878	143,320
1864	44,954	1879	113,108
1865	33,355	1880	187,234
1866	42,680	1881	197,843
1867	75,864	1882	204,341
1868	102,112		

Total gross tons 2,531,308

The present force employed is 400 men.

The officers are S. G. Mather, President, Cleveland, Ohio; Jay C. Morse, Agent, Cleveland, Ohio; D. H. Bacon, Superintendent, Ishpeming, Mich.

LAKE SUPERIOR MINING COMPANY.—(APRIL 24.)

The Lake Superior iron mine makes the largest out-put of ore of any mine in the State, and the quality is of the best. The ore sells readily in the market and at the highest price, and is suitable for making all the kinds of iron for which Lake Superior ores are adapted. The mine was never in so good condition as now, never in shape to afford so great an amount of ore as could be mined if the demand were such as to justify the mining of it. The annual out-put of nearly 300,000 tons has, apparently, made little advance toward exhausting the mine; there is a world of ore in sight, and the explorations made with the diamond drill have shown that beneath the present bottom of the mine the ore still continues to a depth that will suffice for many years to come.

A detailed description of the underground workings of the Lake Superior mine was given in the report for 1881, and as that includes also the methods of mining and all essential facts that would be of general interest, a similar description will not be attempted at this time. It suffices that the enormous shipment tells its own story,—it is a wonderful deposit. There is a world of ore in sight, and every year of future working is sure to reveal an equal show of treasure.

The quality of the ore is shown by some recent analyses that were made by Mr. C. E. Wright of samples of the present stock pile. The samples were taken by the officers of the company from every part of the stock piles, and were intended to represent the average. The results of the analysis gave an average of exactly 68% in metallic iron, and the amount of this ore now in stock is 150,000 tons, which including 15,000 tons of hematite, makes the total of ore on hand ready to ship 165,000 tons.

Owing to the fact that no contracts have been made for sale of ore, and the generally unfavorable out-look in the iron market, the Lake Superior company, in common with all others, has greatly reduced its working force; thirty-three per cent of the number of men have been discharged, leaving the total number of employes at the present time five hundred. No effort is making to get out a large amount of ore. In fact more of the men would be discharged and the work still further circumscribed if it could be done with economy and safety. With too small a force the relative cost of the ore would be increased, and later in the season when the shipping season really arrives a considerable force will necessarily be required, which it then might be difficult to secure.

The product now, as heretofore, comes mainly from pits No. 2 and No. 3, in which they are now stoping in the 440-foot level, and are sinking to the 480-foot level. The levels are 40 feet apart, and 20 to 25 feet of the ground taken out, the rest being left for a floor. About forty per cent of the ore is thus left in the mine for perfect security. When the end is reached, and there is to be no further extension of the pit, these floors will be also removed. Mr. Hall's plan for accomplishing this is to fill the mine from the bottom, sending down rock and dirt from the surface, and thus rising up and removing in succession, towards the top, the pillars and floors. In No. 2 pit, on the south side against the south foot-wall, they made a vertical boring, which was 180 feet in ore. This shows the vertical dip of the foot-wall and the continuance of the ore.

At 180 feet the foot-wall was struck, but the ore undoubtedly continues to follow it. These pits are connected with No. 6, further to the southwest, in the 180-foot and in the 280-foot levels. No. 6 and No. 7 pits are gradually driving towards each other. The latter is the most westerly pit, and there is still 350 feet of solid ground between the extremity of its easterly drift and the westerly drift from No. 6. These drifts are undoubtedly in the same deposit of ore, as they tend exactly towards one another.

In No. 6 they are stoping in the 5th level, and have sunk to and are opening out in the 6th level. The pit has a length of about 400 feet, somewhat increasing as greater depth is attained.

The Hematite mine is looking extremely well, and is in excellent condition for systematic working. A product of 50,000 tons could be raised from this mine the present season if the ore market were such as to demand it. The quality of the ore is the best. A recent analysis made by Mr. Wright of an average of samples collected by the company from all parts of the lower level of the mine gave as a result 64% in metallic iron. They have recently struck in the bottom a deposit of soft blue ore, that is now using at the Deer Lake furnace with excellent result. The mine is down to the 340-foot level, and in this they are now drifting, and all the indications in the bottom are as favorable for a continuance of the ore in all its magnitude as were afforded in any of the levels above. The ore thus far taken from the two lower levels has been wholly derived from the drifts. The great body remains intact ready for stoping. It is certainly an extraordinary deposit; one of the largest bodies of first class hematite ore that is known in the whole iron region.

The mine is wholy underground, and great care is taken to render it safe. Capt. Hall states that in the past nine years only one man has lost his life in this mine.

The machinery has been for some time esteemed inadequate, and a new hoisting plant is now placing in the main engine house for operating the shaft in this mine. This additional hoisting machinery will comprise 4 Lane drums each 8 feet diameter. The hoisting machinery at the Lake Superior mine is excelled by none in the iron region. The four new Lane drums that were put up when the engine house was completed upwards of one year ago are each 12 feet diameter. Twenty-four air drills are used at the present time in the mine.

"A" shaft, the most easterly one in the mine, is simply sinking, no ore is at present mining in this pit. The shaft is extending to reach the body of ore that was discovered by the diamond drill, 200 feet below the surface. The boring was made in the "base ball ground" near the Catholic church, and 50 feet of first-class speculor ore was found. The inclination of the skip to reach it is at an angle of 31°-56° with the horizon, inclining to the north. The distance which the shaft must yet be extended to reach the ore is 200 feet, that is to the drill hole, though it is probable that the ore will sooner be cut. This body of ore that it is sought to reach is probably first-class. That which the pit has thus far afforded, while high enough in metallic iron, is also too high in phosphorus for bessemer steel, and it is for this reason that no ore is now mining in the pit. In reducing the mining force "A" shaft was of the part of the mine that the men were first withdrawn from.

The number of surface men employed is 106, the rest are underground laborers. The company keep a "boss" in every pit, and the mining work is done partly on company account and partly on contract; but whatever the arrangement the work is all done under direction of a company boss. Mr. Hall states that one-half the total expense is chargeable to surface account, and this is true for each year; the underground mining cost and the surface expenditure have been found to equal each other.

The Lowthian, which is the only outlying mine worked by the Lake Superior company, is also in excellent shape; its product in 1882 was 35,000 tons, and there will be no difficulty in duplicating it in the present year if the company so desire; but at this mine also the working force has been reduced, so that at present only 60 men are employed. The Lake Superior mine is situated in the south part of the city of Ishpeming, and joins both the Cleveland and the Barnum. The Lowthian mine is about three miles to the south. The capital stock of the company is now 60,000 shares of a par value of $25.

The local officers are C. H. Hall, Agent, Ishpeming; W. H. Johnston, Superintendent: John McEncore, Mining Captain.

Product of the mine for each year is as follows:

Years.	Tons.	Years.	Tons.
1858	4,658	1871	158,074
1859	24,668	1872	145,070
1860	33,015	1873	158,428
1861	25,145	1874	104,311
1862	37,704	1875	119,365
1863	78,976	1876	110,570
1864	86,773	1877	127,349
1865	50,201	1878	104,674
1866	68,002	1879	174,747
1867	114,935	1880	204,094
1868	105,745	1881	262,235
1869	125,560	1882	296,504
1870	166,582		
Total gross tons			2,937,418

THE JACKSON IRON COMPANY.

No mine in Marquette county has done more to establish the reputation of the district than the Jackson; its ores have always been a standard in quality. To know that it was Jackson ore, or as good as the Jackson ore, has ever been a sufficient recommendation; and while it is not the largest producer, its product remains very uniform in quantity and quality.

In going through the mine one finds very little change either for the better or the worse; the average outlook is about the same as has been observable for years past. New openings or new discoveries are annually made to supply those which are partially depleted or exhausted. It would be impossible to render a description that should convey to the reader an accurate idea of the mine without he himself having seen it, and having made himself somewhat familiar with it. The formation is so broken up, contorted, and twisted that an attempt to describe it fully would be likely to appear as confused as the mine would seem to a novice who should visit it for the first time.

The Jackson mine is a geological enigma; it is full of surprises. They expect to find ore because they always have found it, but there are very few positive indications to direct them in the search. The circumstances under which the ore sometimes occurs are greatly at variance with the assumed conditions.

If a person, examining the mine, were to construct some, seemingly to himself, very satisfactory theories regarding the formation, and should find after a few years that subsequent developments had completely shattered his hypothesis, he could readily console himself with the reflection that he had fared in this matter precisely as others had done many times before him. Still Capt. Merry's conjecturess are usually correct, at least his attempts to find ore generally result favorably, and thus occasion no great amount of dead work in the way of worthless exploration.

No 6. is still the main pit in the mine, from it comes the greater portion of the hard ore. It has reached a depth of 300 feet from the level of the railroad track, vertically down, and in the bottom has a length of stoping ground of 275 feet, and an average width of 16 feet. The general dip is to the south at an angle of about 56°.

No. 5 is divided by a wall of jasper, the north part is worked out, but south No. 5 is looking well. They have here a vein of ore 80 feet long and 25 feet wide; it extends in the direction of No. 2, and is probably connected with the deposit mined in that pit. They are sinking in No. 2 with the hope of finding the ore again, underlying the bottom, which seems to be extending there from No. 5. The product of these pits is the best quality of hard specular ore.

To the north, west of the main track of the M., H. & O. railroad, between it and the Northwestern road, has been opened what is called the Merry pit. The direction is northeast and southwest, and the dip is to the northwest with a quartzite hanging wall, the latter an unusual occurrence in this mine. It is fine hard ore, the deposit having a width of 30 feet at 60 feet below the surface, in the widest place, but narrowing at the northeast. At a distance of several hundred feet to the northwest, in the direction of the dip, a diamond drill boring was made, which at 200 feet vertical depth passed through 12 feet of the same ore now mined in the Merry pit. It is the intention to bore a second hole further to the southwest. This new "find" seems likely to prove an important adjunct to the mine.

In No. 7, the east pit of the old mine, they have gone down 200 feet below the railroad track, and are at the bottom of the ore, but Capt. Merry thinks, that they have by no means worked it all out yet. The further sinking develops only a mixed ore, and looks similar to that found in the Pendill mine further east. For the present at least, they will not sink from the bottom. There are several levels opened, in each of which is ample stoping ground. The bottom level extends 150 feet southwest from the shaft, and the west drifts find the same ore that is contained above. They are driving south in a narrow vein of fine unmixed ore, which analyses 68% in metallic iron. The drift is in 400 feet, with this ore the whole distance, but only a few feet wide. Wherever it has seemed to widen out or afford any indications of leading laterally into pockets, it has been followed, but no success of this sort has been met with. They are now rising in the drift, hoping to find a pocket nearer the surface, and in any event if much further work is done in this direction they will rise and sink for an air shaft. The matter of getting a sufficiency of air into the drift is a question that must be settled in the affirmative without much further delay. Several methods are suggested but none has been decided upon. This pit yielded last year 14,000 tons, and they have here now in stock 6,000 tons. Quite a "cave in" occurred in this pit on the south side, underground, under the M., H. & O. railroad. It was filled up with dirt and rock from the surface.

In the South Jackson, in the south east corner of section 1, not much is now doing, they are only working a small force in each of the two largest pits, the west and middle pits. The ore in these requires picking over carefully as there is some rock mixed with it; near by was a narrow, shallow vein of ore recently worked out; the ore gives on analysis, 20% of manganese. The ground is full of pockets that have been worked out, everywhere. They have at the South Jackson 7,000 tons of ore in stock, it is of course of the best quality.

The large rectangular pit in the corner that is divided with the Iron Cliff, is nearly exhausted. The body of ore which had a width of more than 50 feet for a length of 250 feet, has narrowed at both ends abruptly, to but a few feet in width. Further west, near the line of the McCumber, a shaft has been sunk inclining downward to the south, and it is in a nice body of ore from which a small stock pile has been made. The South Jackson does not strike one as affording at the present time as good an outlook as it has sometimes heretofore, but if the market were active and the demand for ore such as to require it, the output this season from the mine would be as great as ever, and the work would probably uncover other deposits, so that the future is likely to take care of itself.

The total amount of ore in stock at the Jackson mine is now about 27,000 tons. The total force employed is 200 men.

Product of the Jackson mine for each year has been as follows:

Years.	Tons.	Years.	Tons.
Previous to 1854	25,000	1869	125,908
1856	417	1870	127,642
1857	12,443	1871	132,297
1858	10,304	1872	114,910
1859	28,377	1873	130,131
1860	41,295	1874	94,708
1861	12,919	1875	87,283
1862	46,096	1876	98,480
1863	77,237	1877	80,340
1864	83,905	1878	83,121
1865	65,505	1879	112,921
1866	92,287	1880	120,622
1867	127,491	1881	118,939
1868	130,524	1882	93,670
Total			2,279,806

General Manager, Capt. Henry Merry, Negaunee, Mich.

BARNUM MINE.—(APRIL 25.)

Great things have been expected of the Barnum since the work of opening the new mine began. The ground had been well explored, as fully explained in previous reports, with the diamond drill, and the existance of a body of fine specular ore underlying a great extent of surface had been determined. It was well known that the old mine next to the Lake Superior was worked down to the line and nearly exhausted, so that all interest has centered in the new mine, with entire faith that when opened it would greatly eclipse all that had been accomplished in the old mine in years gone by. One shaft has been opened, and the work that has thus far been done in the ore in this shaft verifies all that had been conjectured. The westerly shaft—designated by the letter "B" as the easterly one is by "A"—where so much difficulty has been met with in the work of sinking, has finally been mastered; that is they are down to the ledge, and well into it, through the 80 feet of intervening quick sand, that for a time seemed an almost insuperable barrier to further progress; but now that this great obstacle is overcome no other extraordinary difficulty is anticipated, and the work is expected to go steadily forward to its final consummation, which is to reach the ore at a depth of about 450 feet from the surface. One hundred and four and a half feet of this distance have now been sunk, and as soon as some preliminary work is completed to dispose of the water, it is estimated that the further sinking will progress at the rate of one foot per day. The cause of the trouble heretofore experienced will be understood when it is stated that the amoûnt of water now constantly pumped from this shaft is between 800 and 900 gallons per minute. One can easily comprehend that so great an influx of water, holding in suspension the sand, would be no trifling matter to sink through. The shaft is timbered down from the surface, and is 24 feet into the ledge. The water pouring down from the surface of the ledge renders it nearly impossible to work; the men, though protected by a canvass roof and clothed with oilcloth, become wet to the skin. To obviate this trouble a drift will made from the bottom for a sump, and the water will be run down outside of the timbering to the bottom, where it will be caught in conveyors and conducted into the sump, from which it will be pumped to the surface. Thus far it has not been found possible to stop the pumps for a moment, even to blast. An experiment of this kind, when the pumps ceased working for a space of 25 minutes, resulted in raising the water in the shaft to a depth of 17 feet. They work two air drills in the shaft and twenty-one men. By the time it is sunk it will be connected with "A" shaft at the bottom by a drift which is extending west from "A" shaft, the latter being 750 feet east from "B."

In "A" shaft they are mining now an average of 200 tons of ore per day; the shaft is 495 feet in depth—vertical—is double, although as yet only one cage is used. In the bottom they have opened west 300 feet, with a tunnel 20 feet wide and of an equal highth, and to the east the drift extends 150 feet. At points 50 feet each way from the shaft, east and west, lateral drifts have been started north and south; to the north rising on the foot-wall at an angle of 45°, and to the south sinking in the ore at a like angle. The shaft does not reach the lowest horizon of the ore, though further to the south the ore is known to rise again, since a drill hole, sunk at a point 300 feet further in this direction from the surface, struck the ore at 100 feet nearer the surface than it is at the shaft, so that somewhere between this point and the shaft the ore changes the direction of its dip.

They will leave a continuous pillar of ore 20 feet wide on each side of the main drift for safety. The only avenues of egress from the mine will be these two shafts, and in case of accident it is intended that whatever befalls, the main tunnel, which will be easily accessible from all parts of the mine, shall be always safe and free from any possible accident. The lateral drifts, above mentioned, west of the shaft, have been extended 80 feet, and those east of it a distance of 60 feet from the main drift; the stopes are at the ends of these drifts.

In going east from the shaft they encountered at a distance of 92 feet a wall of soap rock, along which they drifted north a hundred feet and then turned east again, going 30 feet. From the end of this latter drift a diamond drill hole was bored to the south, which passed through 70 feet of fine ore. The main drift was then continued, and the intervening rock speedily cut through, the drift thenceforward continuing in good ore.

A force of 76 men is employed in "A" shaft, and 12 air drills. The width of the ore averages 20 to 25 feet, and is all first-class. The shaft house is as near fire-proof as they could conveniently make it, being covered with iron roofing material, and is otherwise made as safe as may be against any possible accident. They have a Sturtevant exhaust fan 12 feet diameter in the mine to assist in creating a draft after blasting, and also to insure sufficient air for the workmen in hot weather; it is run by a Corliss engine 14 inches by 48 inches. The mine is a wet one, and seems likely to continue to be so; the water is constantly dripping everywhere from the hanging wall.

The new stone engine house is very conveniently placed between the two shafts, and almost on a level with Lake Bancroft, from which the water is pumped to supply the boilers. The two condensing engines will hardly suffice for the mine when "B" shaft is completed, and it becomes necessary to work two cages in each shaft. There are two duplex compressors, each 16 inches by 30 inches. The shaft to the pumping engine is 18 inches, diameter 14 feet in length.

They are laying pipe to convey the compressed air to the old mine, 1,150 feet to the south. The old mine is now yielding an average of 100 tons per day, and has an apparent lease of life for two or three years to come. In the west shaft they have yet 80 feet in which they can sink for ore. At this mine are 6,000 tons in stock, and at "A" shaft there are 20,000 tons, all first-class ore, and evidently picked over with great care. The total force employed is 250 men.

The Barnum belongs to the Iron Cliff company, and the officers are Wm. H. Barnum, Lime Rock, Conn., President of Iron Cliff company; A. W. Maitland, of Negaunee, Mich., General Manager for the Iron Cliff company; Wm. Sedgwick, Superintendent of the Barnum mine.

The following table shows the product of the Barnum mine for each of the preceding years that it has been worked:

Years.	Tons.	Years.	Tons.
1868	14,386	1876	37,750
1869	37,503	1877	38,314
1870	44,793	1878	26,680
1871	45,939	1879	24,911
1872	38,381	1880	24,921
1873	44,388	1881	27,281
1874	40,255	1882	41,424
1875	40,914		
Total gross tons			527,865

A mile northwest they have opened a hematite deposit the past year, from which were taken a few thousand tons of ore of first quality. They are still working in the pit, but just now it looks as if the deposit were limited in extent.

THE NEW YORK MINE.—(APRIL 26.)

This mine has been very fully described in previous reports, and the peculiarities of the formation somewhat minutely indicated. To enter again into their discussion would necessitate a somewhat superfluous repetition of what has before been written. The mine is in the same ore deposit as No. 3 pit of the Cleveland mine, and is worked along the north side of the Cleveland line. The ore deposit on the New York was embraced in a fold inclining to the south and to the west, and in more recent years the mine was preserved from immediate exhaustion by the fact that at greater depth the ore deposit assumes a steeper downward inclination. Were it not for this fact the mine would have been worked out some years ago. But in addition to the difficulties heretofore contended with, the doom, which has impended over the future of the mine, seems now to be greatly accelerated by a further serious fact, which, if continued, will prove fatal to the already limited prospects of the mine.

Latterly a large percentage of the ore contains pyrites to so great an amount as to render it valueless. All the ore, so far as it is reached, east of No. 3 shaft is for this cause worthless; so that they are at present reduced to a single run of ore 80 feet long and 25 feet wide, lying west of No. 3 and between No. 2 and No. 4. These—No. 2 and No. 3—are the only skip roads now worked in the mine. Nos. 5 and 6, which extend towards the southwest corner of the property, have been worked out and abandoned. They have 13,000 tons of ore in stock, and may increase it 10,000 more during the season; but unless other discoveries are made the future working at this mine will be confined to mining out the limited body of ore still remaining against the Cleveland line. The appearance of the sulphur in the ore, to the extent which it now occurs, is a new feature, and another peculiar fact is that before reaching the line the sulphur entirely disappears from the ore, so that the bar of standing ground that is left along the line is good ore, free from this destructive impurity.

The mine has yielded as follows:

Years.	Tons.	Years.	Tons.
1864	8,000	1874	77,017
1865	12,214	1875	70,103
1866	33,761	1876	58,863
1867	43,302	1877	55,581
1868	45,655	1878	21,903
1869	71,456	1879	57,367
1870	94,809	1880	58,5 2
1871	76,381	1881	49,342
1872	68,950	1882	56,970
1873	70,882		

Total product gross tons 1,031,078

The mine is in the northeast part of the city of Ishpeming and the property comprises 40 acres of land owned by Mr. A. R. Harlow, of Marquette.

The officers are as heretofore, Samuel J. Tilden, President; J. H. McCloskey, Agent; August Beering, Mining Captain; J. C. Cutter, Cashier.

THE CAMBRIA MINE.—(APRIL, 1883.)

The Cambria mine is the most easterly of the mines that constitute what is known as the Teal Lake Range. Its location is about a mile northwest from the city of Negaunee, and but a short distance from the margin of Teal Lake.

The ore is mostly a brown umber colored hematite of excellent quality, all of it suitable for the making of bessemer steel, and for this reason the ore has always found a ready sale at the highest market price.

The company have now 18,000 tons of ore in stock, of a quality equal to any that the mine has ever produced, and the body of ore, particularly at the west end of the mine, is as large as has been seen in the mine at this season of the year, at any previous period. The chief part of the mining has been done at the west end, adjoining the Bessemer, and it is here that the greater portion of the ore now in stock is found, 14,000 tons. The pit next to the west line is worked out, and they are sinking and building a new skip road a short distance to the east in which direction the ore lens is found to pitch. They have opened it sufficiently to prove the large extent of the ore deposit, by drifts east and west and across the formation. These are at a depth of 150 feet below the surface, and were reached by sinking in the bottom of the open pit and drifting east. The ore in this part of the mine is run up in skips, which dump into pockets that stand over the railroad track. The east end of the mine is also looking well, but the company is working a reduced force, 65 men, on account of the general dullness in the iron market.

The product of the mine has been as follows:

Years.	Tons.	Years.	Tons.
1876	6,329	1880	7,232
1877	10,082	1881	18,837
1878	3,754	1882	47,545
1879	6,860		
Total			100,689

It will be seen that the product of the mine in 1882 was nearly equal to the aggregate of the previous years' production.

The company have completed their new engine house, and it is supplied with 4 hoisting drums, 4 feet in diameter.

The agent is A. W. Maitland, General Manager of the Iron Cliff Company, Negaunee, Mich.; Gordon Murry, Mining Captain.

THE BESSEMER.—(APRIL, 1883.)

The Bessemer mine, which joins the Cambria on the west, has been idle since the close of navigation until recently, when the work of unwatering and further sinking the shafts in the two west pits was begun. These pits were filled to a considerable depth with dirt caved in from the sides in February, 1882, and the ore in the bottom was reached by sinking through the overlying debris. When the preparations now in progress are completed, the work of mining ore in these pits will be resumed. The hoisting machinery at the east pit, adjoining the Cambria, is removed to be used at the west pits. The ore next to the Cambria has been mainly worked out. They are now mining out what little remains, and hoisting it with a bucket. The ore is of the best quality and sells at the highest market price for hematite. The mine is owned and operated by C. M. Wheeler, of Marquette, though the fee of the land is in the Teal Lake Iron Company.

The mine has yielded as follows:

Years.	Tons.	Years.	Tons.
1875	144	1879	21,681
1876	6,801	1880	18,347
1877	10,127	1881	16,718
1878	8,506	1882	28,221
Total			110,545

West from the Bessemer is the

FOREST CITY

At which no work has been done in the past year. The engine house, however, which was erected and provided with machinery, a short time before the mine shut down in 1881, has been destroyed by fire.

Next west from the Forest City is the

CLEVELAND HEMATITE,

Which has already been described in connection with the Cleveland Company's other mines, and adjoining this latter is the Detroit, formerly the Norwich Mine, but now the property of the

DETROIT IRON MINING COMPANY (APRIL 27TH, 1883,)

By whom it is operated. The location is the northeast quarter of the southeast quarter of section 2, and is situated one mile north from Ishpeming. The transfer of the mine to the present company was made in October last, and the ore which is pronounced excellent for foundry iron has been sold to the Deer Lake Iron Company, and smelted in their furnace. The ore affords by analysis 58% of metallic iron, and in the furnace yields 53.77%. Worked alone it makes a soft No. 1 foundry iron.

Previously to February 1st last, the mine had been worked in an open pit, but at that time the pit caved in from the south side, and when the dirt was sufficiently removed to get at the ore, it was found to have been nearly exhausted. Since then the work has been mostly in the way of underground exploration. A drift has been run from the west end of the pit to the west, heading to the north. In this drift ore was found at 90 feet from the pit and they passed through 60 feet of it, mixed ore and rock. At 120 feet west a shaft was sunk 50 feet deep, 30 feet of which was through ore, through which they have drifted north 80 feet. The ore is mixed somewhat, but so far that taken from the drift and the shaft has gone to the furnace and given satisfaction. They seem to have a large body of this ore such as it is, and are nearly in readiness to mine it. A new engine house will be built, and the engine which they already have placed in it, together with other suitable hoisting machinery. A few buildings consisting of a large boarding house for the men, office, warehouse, shop, barn, etc., have been erected. Thirty men are employed. It is probable that they have not gone deep enough yet to fully test the mine.

The company own the fee of the land. The officers are John F. Newbury, President; James McMillan, Treasurer; W. K. Andrews, Secretary; Detroit, Mich.

The product of the mine in 1882 was 5,402 gross tons.

NEGAUNEE CONCENTRATING COMPANY.—(APRIL, 1883.)

The works of this company, which are built on the Jackson company's property, a short distance north of the mine, have been partially in operation during a portion of the past year, but more or less difficulty has been met with, necessitating changes and additions in the machinery, etc.; so that they are yet not fully completed. One of the troubles, which they have lately mastered, was in the rollers; they were made in Chicago, and speedily wore concave so that they would not properly crush the rock; the company having built a foundry for doing their own work, have succeeded in making a chilled face to their rollers, which shows no signs of wear; the castings are composed of a mixture of Lake Superior, Salisbury ores and steel.

Up to this time the average analyses of the ore that they have obtained from the rock give a percentage of iron of 62 30-100%. They think of making two grades, grinding over the refuse and getting a 57% ore from it. They get from the rock so far 33⅓% of ore. It will be remembered that these works were made to work up the jasper walls and waste piles of the Jackson mine. The buildings and machinery are extensive and of the most substantial character. The present capacity of the mill is estimated at 600 tons of rock per day, making 200 tons of merchantable ore. It is expected that the ore thus prepared will sell somewhat higher than ore of the same quality direct from the mine; the fact of its being crushed being to its advantage. The product certainly looks well.

The rock is drawn up an incline on the west side of the mill to the top, where the cars discharge into the rock bins; of these there are five. The inclination of the track is 28°. The capacity of the bins is 1,000 tons. Below each bin is a large Blake crusher, into which the rock is drawn out, thence below it drops into a roller, and again in succession through a second series of smaller crushers and rollers. The latter are 3 feet in diameter, and 18-inch face. Two 30-inch belts, each 278 feet in length, connect the engines with the mill machinery. The incline track is operated with a small engine and a Lane drum. The two main engines are respectively 24 inches by 48 inches and 24 inches by 40 inches, cylinders.

It is expected that the mill will soon be in complete working order. Mr. W. A. Allen, the gentlemanly superintendent of the works, expresses entire confidence in the ultimate success of the undertaking. He tells me that these are the most extensive concentrating works in the United States.

THE NEGAUNEE HEMATITES.

MAY 1st, 1883.

McCUMBER MINE.

The McCumber, as are all the Negaunee south-side hematites, is idle. It is not from lack of ore, however, for the mine is in condition to produce as great a quantity as it ever did. In point of fact it is evidently in better shape than it has been for some years, but the company continued work until they had 12,000 tons of ore in stock, and then decided to stop mining until it should be determined whether the ore could be sold, at least if it could be disposed of at a price that should pay the cost of mining. The pumps are still at work and the mine kept free of water. Some surface work is in progress, and they are ready to start in again if it shall seem advisable.

The greater part of the mining work is now wholly underground in No. 3 and No. 9 shafts. No. 3 is opened in three levels, the first is 154½ feet below the collar of the shaft, the second is 178½ feet down, and the third 206½ feet, and there is stoping ground in all of them. The first level extends west to the line of the property, widens out in places into large chambers, and is opened to the east 400 feet, besides there are large openings to the south of the shaft, and a drift to the northeast 250 feet long which ends in a pocket of ore. The second level is not quite as extensively opened as the first, and in the third they have drifted in a horseshoe shape, with the toe at the shaft and the ends to the southwest, thus following the hanging wall and have not cross-cutted to the foot, but have ore between these branches. The ore is nearly as good in the bottom as it was in the upper levels; it looks as well but is said not to analyse as well.

No. 9 is a fine vertical shaft well timbered up, 12x12 inside the timbers, and divided into 4 compartments for double skip hoist, the ladder-way and pump-pipes. It will finally be used to drain the whole mine. No. 3 shaft will drain to it as soon as they are connected, as they soon may be, and No. 5 pit which yet has a large amount of ore in sight will find its outlet both for product and the waste through an underground drift to No. 9 shaft. The shaft is now 180 feet deep, and will be sunk 50 feet more to bring it to the same horizon as the bottom of No. 3, it being in higher ground.

They are erecting a high trestle from this shaft, 300 feet in length, to a branch of the M., H. & O. railroad that has lately been extended to the mine from the Manganese property. This elevated track is placed high enough to give space for an ore pocket to be built above the railroad, into which the ore may be dumped and thence "chuted" into the cars.

The C. & N. W. Co. are also to build a track to No. 3 shaft coming in from the west through the South Jackson and Section 12 mines. This will save all the carting, which has heretofore been a considerable of an item, as the ore had to be drawn quite a distance from the shaft and pits down to the pockets and docks by the branch railroad.

Capt. J. C. Foley took charge of the affairs of the mine in August last, and the results of his energy and skill are manifest in the appearance of the location. Capt. Charles Cox still remains in charge of the mining, work, etc.

The property is upon the side hill south of Negaunee, and overlooks the whole city.

The description is the N. W. ¼ of the N. W. ¼ of section 7, and the south part of the S. W. ¼ of the S. W. ¼ of section 6, T. 47, R. 26.

The product of the mine in years past has been as follows:

Years.	Tons.	Years.	Tons.
1870	4,866	1877	19,691
1871	15,442	1878	30,180
1872	25,030	1879	28,962
1873	38,332	1880	31,028
1874	2,642	1881	28,230
1875	10,357	1882	40,390
1876	17,282		
Total number of gross tons			292,932

THE MILWAUKEE MINE.—(APRIL 29TH.)

This mine was carefully examined and fully written up last June, and the description published in the report for 1881, and there is not much to add, especially as the mine is mostly filled with water. I went to the mine and experienced the sensation which the unpleasant contrast affords between the present idleness and the activity which formerly prevailed.

Mining work was discontinued in February last, and since then the only work done is to keep the water out of No. 7 and No. 8 pits, in the hope that the ore market might sufficiently revive to induce the resumption of work, if only to a moderate extent. Previous to stopping 10,000 tons of ore were mined, and are now held in stock. One difficulty which the section 7 mines contend with is the excessive royalty which they have to pay on the ore; 75 cents per ton is at least one-third too high.

The only pits that are now deemed of value in the Milwaukee mine are Nos. 7, 8, 9, and 10. The two former are together, and really form one and the same pit. They are worked underground, dipping to the south, and extend east and west, giving a stope 200 feet long and 6 feet to 25 feet wide. The ore deposit in these pits is widening out apparently, and so far there is a good body of ore here. No. 9 pit is further to the north; it is worked underground and entered by two shafts 300 feet apart, which follow down the foot-wall to the south. Its product is a beautiful umber colored hematite, that Captain Foley says is well liked by furnace men.

No. 10 pit is close to the west line; in fact the line crosses the open pit dividing it between the Milwaukee and the Wheeling iron company. The pit has a good body of ore, which analyses the best of any in the mine, being above 60% in iron and below 1-100% in phosphorus.

Captain J. C. Foley remains agent of the company, and Captain Gilbert Car-michael is still in charge of the location. The estate comprises 40 acres of land in the center of section 7 south of Negaunee; it is held by the company on a lease from the Negaunee iron company.

The product for each year has been as follows:

Years.	Tons.	Years.	Tons.
1879	941	1881	31,254
1880	13,142	1882	41,200
Total gross tons			86,537

THE WHEELING IRON COMPANY.—(MAY 1ST.)

This is a new organization, formed to mine in the land which joins the Milwaukee on the west. The only discovery of ore which has been made is the westerly extension of No. 10 pit of the Milwaukee mine. This has been stripped of the drift down to the ore for a distance west of 70 feet, and it shows a width of ore of 60 feet, measured horizontally north and south. South from this opening, 300 feet, is the diorite, which rises abruptly to a considerable highth. The ore analyses well; samples gave 62½% in metallic iron and .084% in phosphorus. The estate comprises 80 acres in section 7, joining the Milwaukee and the McComber mines. It is held on a lease from the Negaunee iron company.

The officers are Daniel McGarry, President, Cleveland, Ohio; J. C. Foley, General Manager, Negaunee, Mich.

No ore has yet been mined. It was intended to proceed with mining if the iron market had warranted it.

THE ETNA IRON AND EXPLORING COMPANY (MAY 1ST)

is also a new organization, which has resulted from the success of the exploration prosecuted last summer on the Manganese property, being the N. E. ¼ of the N. W. ¼ of Sec. 7-47-26, and joins the McComber on the east. They have uncovered a deposit of ore 145 feet long, east and west, and 22 feet wide; the opening is 50 feet long. The company are now working a force of 15 men, and have contracted 5,000 tons of ore, but hope to get out this season 8,000 or 10,000 tons. They have a good showing, and if the ore holds out, as there is no reason to doubt but it will, the company will accomplish their intention.

The officers are J. C. Lewis, President, Marinette, Wis.; J. P. Lombard, Treasurer, Marinette, Wis.; J. M. Gannon, Secretary, Negaunee, Mich.; Capt. Wall, Superintendent.

A branch of the M., H. & O. R. R. runs along near the pit. The land is held on a sub-lease from M. Shaad, who holds from the Negaunee iron company. On the adjoining 40 to the east a good "find" of ore has recently been made by the Miller brothers of Negaunee.

THE NEW YORK HEMATITE MINE

has been idle since the close of navigation, and there is no ore in stock. Some negotiations were pending for the sale of the mine in the fall, and the owners expected that the sale would be consummated, and the suspension of the work was primarily due to this cause. Since, however, the ore market has been so uncertain that it has not been deemed advisable to start up. The explorations which were made last summer on the property with a drill, and which were at one time thought to be looking very favorable, resulted finally in a failure, nothing really of value was discovered.

The mine has produced as follows:

Years.	Tons.	Years.	Tons.
1870	1,809	1877	3,307
1871	2,921	1878	4,674
1872	9,925	1879	2,737
1873	6,629	1880	2,063
1874	------	1881	------
1875	750	1882	1,970
1876	450		
Total gross tons			37,241

The mine is on section 6, south of the city of Negaunee but a short distance.

J. C. Foley, Agent, Negaunee, Mich.

THE ROLLING MILL MINE

Has continued idle, except some explorations which were made last year, which resulted in failing to find anything of value. The mine has yielded in the past 215,865 gross tons.

THE STAR MINE,

On section 8, was described last year, and while considerable subsequent work was done, they have not yet succeeded in developing a very promising mine. The work has been suspended.

THE CHICAGO MINE,

In the southeast corner of section 7, has been idle for a year past. The ore that was in stock in the spring of 1882 yet remains unsold. The mine has yielded 8,895 tons of ore.

THE BAY STATE MINE

Got out 1,593 tons of ore last year, but no work has been done since October last. Its prospects are not extremely flattering, though they have a small deposit of ore which might develop into greater magnitude on further working. The total number of tons shipped in past years is 16,768 gross tons. The location is on section 8, southeast from Negaunee one mile.

THE VALLEY CITY IRON COMPANY

Have been exploring east from the Pioneer furnaces in Negaunee, having bored three drill holes, in two of which a moderate thickness of ore was found, covered, however, with 40 feet of quicksand, succeeded by rock. The company began the work of sinking a caisson through the quicksand to reach the ledge, but operations have been suspended. The land held by the company comprises 80 acres, held on a lease.

Mr. G. F. Case, Agent, Negaunee, Mich.

THE PENDILL MINE,

Situated just south of the Union depot in Negaunee, has been practically abandoned; the pumps have been taken out, and the mine is filled with water. Borings were made in various parts of the mine last summer with the hope of discovering other deposits of ore, but without avail, and there is nothing left to mine but the pillars, some of which still remain; however, it is doubtful if it would pay to pump out the water to obtain the ore in them. There is about 1,700 tons of ore at the mine in stock. The mine has yielded 25,088 gross tons.

H. A. Burt, Agent, Marquette, Mich.

THE SECTION TWELVE MINE,

Belonging to the Iron Cliff company, is located in the northeast corner of section 12-47-27, and joins the South Jackson mine on the north and the McComber mine on the east. The mine was very fully described in the last report, and there is nothing to add. The ground is limited by the diorite bluff on the south and the sections lines north and east, so that in this locality the mine cannot become a large producer. The quality of the ore is excellent. All work at this mine was suspended in the fall, and there is no ore in stock. The mine yielded in 1882, 5,176 tons. Its total product to date, 23,734 gross tons.

A. W. Maitland, General Manager of the Iron Cliff Company.

THE FOSTER MINE

Is the oldest of the Iron Cliff company's mines, having been opened in 1865, and furnished one of the earliest hematite ores shipped from the district. The ore requires careful sorting, but is good in quality. The mine is situated on Sections 22 and 23, T. 47, R. 27, and previously to December, 1881, had been for some years idle. During the past year, 1882, 10,593 tons were mined, 2,037 tons of which were smelted at the Pioneer furnaces at Negaunee, the rest was shipped below. The company are now working 30 men at the mine, and are mining in two open pits, No. 1 and No. 3; No. 2 pit has been abandoned. No new pits have been opened, and the work has not been pushed underground. The mine looks very much as heretofore. No. 1 pit is below the hill, and they are stoping the ore in the bottom of it, when there is a good showing of it. In No. 3, on the hill, they are stoping back along the whole face of the pit, and have not sunk any, while in No. 1 they are going deeper. They have at the mine 7,000 tons of ore in stock. It is expected to use the product at the Pioneer furnaces. The total product of the mine to close of the year 1882 has been 119,549 gross tons.

THE SALISBURY MINE (MAY,1883,)

Is second only in importance to the Iron Cliff company's mines; it affords annually a large product of excellent, soft hematite ore, that yields a high percentage in metallic iron, and is low in phosphorus. The product of the mine for the year 1882 was 42,019 tons; 41,603 tons of which were smelted at the Pioneer furnaces in Negaunee. The mine is in shape to furnish an equally large output the present year, but it is not probable that it will be done, since the mining force has been considerably abridged, owing to the stagnation which prevails in the iron market. The usual number of men employed, when the mine is worked to its full capacity, is 85; at present only 32 men are engaged. The mining work is mainly confined at the present time to the west open pit, where they are stoping in the bottom.

In the east part of the mine, which is extensively worked underground, they have lately sunk for another level, and are well opened for mining, which will be resumed when the market warrants it. The underground work reaches 300 feet east from the shaft, and at the extremity they have been rising for another shaft. The mine is well timbered and rendered secure, and shows an abundance of ore; its depth from the surface is 200 feet. There are now in stock at the mine 16,240 tons of ore.

Captain Bartle still remains in charge of the mining work. The several years previous experience which he has had in the western mines has familiarized him with the system of timbering practiced in that region, and the application of the knowledge which he has thus obtained is of great value in the Salisbury, where, notwithstanding the precarious nature of the ground, he has succeeded in thus far avoiding all serious accidents.

The Salisbury has yielded as follows:

Years.	Tons.	Years.	Tons.
1872	545	1878	52,155
1873	11,023	1879	39,770
1874	6,730	1880	22,387
1875	4,571	1881	41,888
1876	20,510	1882	42,019
1877	37,868		
Total gross tons			279,466

The location of the mine is on the south side of the high diorite bluff, which separates it from Lake Angeline, being about a mile and a half south from the city of Ishpeming.

LAKE ANGELINE MINE,

Situated at the west end of Lake Angeline and a half of a mile south of the Lake Superior mine, in the city of Ishpeming, has been working for many years in the open pits between the lake and the high greenstone bluff that rises very abruptly on the south, until the pits have reached a great depth, and the ore in the bottoms is nearly exhausted. The only ore that is now taken from these open pits is at the west end of the west pit, where a few men are now stoping,—April 25th.

Some years ago a shaft was sunk to the northwest, 200 feet from the pit, and came into good ore, but the shaft was so small that no great amount of exploration could be carried on in it. Within the past year the work of enlarging this shaft and sinking it deeper, etc., has been undertaken and carried forward. The shaft is a large one, sufficient in size for a double cage, pump shaft, and ladder way. It is well lined up and sunk to a depth of 200 feet, 100 feet of which is in good ore, and they have drifted in this ore, south across the formation, 240 feet. Samples of the ore have been taken every ten feet of distance in this drift and analyzed. These analyses show the ore to be about 64% in metallic iron—2% in silicon and .025% in phosphorus. It is thus an immense deposit of excellent hematite ore. The mine will thus soon be wholly underground. A trestle is building from the shaft to the railroad, sufficiently elevated for ore pockets at the end, and for stock pile.

The officers are John Outhwaite, President; L. E. Holden, Secretary and Treasurer; A. Kidder, Agent, Marquette; Harvey Diamond, Superintendent, Ishpeming.

The mine has yielded as follows:

Years.	Tons.	Years.	Tons.
1864	19,500	1874	30,499
1865	20,151	1875	30,282
1866	24,073	1876	22,539
1867	46,607	1877	19,113
1868	26,651	1878	28,161
1869	39,644	1879	25,420
1870	53,467	1880	14,794
1871	33,645	1881	18,000
1872	35,221	1882	14,518
1873	43,933		
Total gross tons			546,328

THE NATIONAL MINE

Is about two miles southwest from Ishpeming, in the inner side of the semicircular diorite range that opens to the northwest. The west mine, near the "Old Parsons," in section 16, was abandoned last fall; the pumps have been taken out, and there is no present intention of resuming mining work at this point. The diamond drill borings which were made across the formation below the mine workings failed to discover anything of value, and it was decided that the outlook was too unfavorable for further endeavor. But the east mine, on the hill, is looking as well as it ever has. The mine is wholly underground from the bottom of the open pit, 250 feet from the surface, and is reached by a skip road that descends to the west from the east side of the pit, whence the product is taken in the tram car, into which the skip is emptied, around to the ore pockets and stock pile by the side of the railroad. The stock pile has assumed pretty large dimensions, and necessitates the extending of the dock to deposit the ore.

The product is a very peculiar looking ore; much of it is a hard, bluish colored, porous ore, that has much the appearance of furnace slag; it is, however, a good ore, and from a large number of analyses shown to me by Capt. Mitchell I can realize that it should give good satisfaction. One made in Cleveland of the ore in stock there last season gave

Metallic iron	65.625
Silicon	3.866
Alumina	.550
Sulphur	.028
Lime	.130
Magnesia	.018
Phosphorus	.070

Another made by Mr. Wright of samples sent him by Capt. Mitchell gave:

Metallic iron	66.34
Phosphorus	.153
Lime	1.850
Silicon	1.780

Samples also collected by Capt. Mitchell from same pit as the above gave:

Metallic iron	65.170
Phosphorus	.118
Silicon	2.800

Average samples of a reddish colored fragmentary ore, regarding the value of which some doubt was felt, were collected by Capt. Mitchell, and the analysis gave:

Metallic iron	62.85
Phosphorus	.086
Silicon	5.200

They have now 12,000 tons of ore in stock at the mine. The ore is harder than formerly, and altered in appearance, but the change is not for the worse; it sells for hard ore. They are mining in three levels and are sinking for the fourth. The work is all north of the shaft, and extends 200 feet, showing a width of ore of from 6 feet to 20 feet, with indications that it is widening out and increasing in volume as greater depth is attained. The total force employed at the present time (May 3d) is 45 men; they are working only day shift. A diamond drill hole was bored across the formation below the mine to the north, but no ore was found. They are now boring in a similar way to cross the formation to the south.

Capt. Williams, as heretofore, has charge of the mining work, but the affairs of the company are directed by Capt. Samuel Mitchell, who is also one of the principal owners of the mine. The company hold 240 acres, embraced in the E. ½ of Sec. 16, T. 47, R. 27.

The yield of the mine for previous years has been as follows:

Years.	Tons.	Years.	Tons.
1878	4,191	1881	24,699
1879	33,769	1882	23,366
1880	29,043		
Total gross tons			115,068

THE WINTHROP MINE (MAY 3D)

Is unfortunate. A year ago, when ore was in good demand at a fair price, the mine caved in on one side of the deep open pit, and a great expense and loss of time was incured in hoisting all this rock and dirt to the surface to the obstruction of mining; and this season, when they are all ready to mine, they are wholly estopped, as a result of a suit which is pending in the United States court. However, they have plenty of ore ready to stope. The mine is in good shape, the ore is of the best quality of soft hematite, and will readily sell at any time, even now if they had it out; so that when the present embarrassment is tided over, the company ought to meet with reasonable success.

They have about 9,000 tons of ore in stock, but just now are not mining at all. The vertical shaft, which was begun something over a year ago, is down 200 feet. It is expected that it will have to go down 400 feet to strike the main body of the ore. It is expected that the suit will be so adjusted that mining work may proceed before long. The property is the S. W. ¼ of Sec. 21, T. 47, R. 27, and the mine is near the center of the section joining the Mitchell mine.

The officers are J. O. St. Clair, President; E. G. St. Clair, Secretary and Treasurer; and Geo. A. St. Clair, Superintendent, office Ishpeming, Mich.

The mine has produced as follows:

Years.	Tons.	Years.	Tons.
1870	2,469	1877	12,549
1871	7,319	1878	23,740
1872	14,239	1879	27,050
1873	31,150	1880	45,247
1874	8,248	1881	43,900
1875	8,642	1882	23,259
1876	27,236		
Total gross tons			276,028

The company have lately leased the Mitchell mine, and will hereafter work that in connection with the Winthrop.

THE MITCHELL MINE (MAY 17TH)

Has been recently sold to the Winthrop Hematite company, by whom it is now controlled and worked. The two mines are close together on opposite sides of the line which divides the properties. The mine is now wholly underground, and its workings are quite extensive; they are reached by three shafts, designated as "A," "B," and "C," and a fourth one, "D," will be sunk further to the east. The levels are as sinuous in their direction as the course of a brook in the meadow where it meets with frequent obstructions. The second level has a length of 900 feet, very irregular, and widening out into chambers, in places.

The present owners have done no sinking, but have confined all their mining work to the levels already opened—2d, 3d, and 4th levels,—mainly in the vicinity of "C" shaft. Before the end of the present month it is expected to be working also "A" shaft. The latter is 188 feet deep, "B" is 160 feet deep, and "C" one level below "A." They are mining now 3,500 tons per month, but intend to increase this to 5,000 tons when a product from "A" shaft is added. In the 2d level some cross cuts showed a large amount of ore. This ore in the Mitchell is probably south of that found in the Winthrop, except in "A" shaft, which is near the Winthrop, and to the south, and probably reaches the Winthrop run of ore. The ore is of fine quality of soft hematite, and presents three distinct varieties, which are mined and stocked separately. They are designated as the white ore, blue ore, and the run of the mine. Several analyses of these ores were shown me made by different chemists.

Blue ore from "A" shaft:

Metallic iron	64.67
Phosphorus	.151
Silicon	4.04

Blue ore:

Metallic iron	66.80
Phosphorus	.129
Silicon	1.30
Alumina	1.010
Lime	1.100

An analysis of an average of the mine, of samples collected by Capt. Mitchell, made by Mr. Wright gave:

Metallic iron	66.10
Phosphorus	.306
Silicon	.158

The white ore is Bessemer; an analysis of average samples gave:

Metallic iron	66.00
Phosphorus	.046
Silicon	1.64

They have 14,000 tons in stock; 3,000 tons of which are the blue ore. They have had to rebuild the engine house, which was burned down. To work this mine will require great care, as the support to the ground must be almost wholly artificial; the ore is very soft, and on exposure becomes like dirt; the rock has little tenacity. On the evening of the day I visited the mine a man was killed in the mine by being buried in a fall of ground, and without much care and foresight such an accident might involve the loss of life of a large number of men. The force employed is 100 men.

The annual product has been as follows:

Years.	Tons.	Years.	Tons.
1872	197	1878	4,259
1873	8,552	1879	11,450
1874	7,699	1880	12,753
1875	------	1881	20,965
1876	5,596	1882	33,396
1877	3,897		
Total gross tons			108,764

The officers are the same as those of the Winthrop. The mine is about 3 miles southwest from Ishpeming, being in the S. E. ¼ of Sec. 21-47-27, near the center of the section.

THE SAGINAW MINE

Has permanently closed down. The present company have decided that they will make no further effort to work it. There are about 3,000 tons of second-class ore at the mine that will be shipped to the owners. The product in 1882 was 11,259 tons, and the mine has produced in the aggregate 429,274 gross tons.

Capt. Samuel Mitchell, Agent, Stoneville, Mich.

THE GOODRICH MINE,

Which adjoins the Saginaw, has also shut down, but not finally. The suspension is due to the condition of the ore market, rendering it probable that the ore could not be sold. The ore is scarcely first-class, and it seems likely that there will be sufficient difficulty in disposing of first-class ore at a profit. The mine is in the W. ½ of the N. W. ¼ Sec. 19, T. 47, R. 27, southwest of Ishpeming. Work suspended on March 1st, last.

The mine has produced as follows:

Years.	Tons.	Years.	Tons.
1873	3,258	1878	7,547
1874	3,048	1879	3,992
1875	1,718	1880	11,181
1876	------	1881	10,245
1877	503	1882	9,987
Total gross tons			51,479

THE CASCADE RANGE.

MAY, 1883.

Exploration in this range, of which so much was done in the past two years, has all been abandoned. A number of companies were organized—The Grand Rapids, Laxey, Wick, Clancy, Mexican, etc.,—which were described in the last report, and little has since been done at any of the locations which were made, and nothing of much value was found. A little ore is obtained, just enough to excite the hopes of the operators and stimulate to further effort, but never enough to make a paying mine.

They have all been abandoned, and probably permanently so. The only ones working are the only ones that have been shown to be worth working; these are the Palmer and the Wheat mines. The former, owned by

THE PITTSBURGH AND LAKE SUPERIOR IRON COMPANY—(PALMER MINE,)

Is the only considerable mine in this range, and this one on the whole shows some improvement. The work is now confined to the old mine. No. 5 pit, to the south, which was begun a year ago to mine a deposit of ore that had been reached with the diamond drill, is worked out; the deposit proved to be a small one; and No. 6, near the location, had a similar result. In the latter they sunk 130 feet, following a drill hole, but the deposit did not prove to be large enough to pay to work. Further exploration will be made with the drill to prove the formation at greater depth at this point, and also near No. 5 pit.

The lenses are generally small detached deposits. No. 1 pit is the only large deposit that has been found in the mine; the others shorten up at the ends, and do not hold in depth. No. 1 is the farthest to the north and west, and holds good; they now have a run of ore in the bottom 200 feet in length and 10 feet to 12 feet in width, at a depth of 375 feet from the surface on the lay. They are working two stopes, and are sinking another lift. In the bottom of this sink the ore is 12 feet wide. The ore is good quality of hard slate ore, 65% in iron, but too high in phosphorus for Bessemer pig. In the hanging wall of the mine, 75 feet north of the main deposit, is another lense 6 feet wide, which has been reached by cross cuts from the main vein; but this appears to be coming into the large vein; in fact it connects with it at the south end, so that they run a track into it by branching from the main track, using a Y instead of cross cuts, as heretofore has been necessary in the levels above. They are now mining 125 tons per day.

Nos. 2 and 3 pits are small; the former is not working, but the latter is improving, and at the present depth, 300 feet, is 6 feet wide. No. 1 lengthens every year, and will perhaps eventually absorb the whole mine; it is already in front of No. 3, and they think of cross-cutting from No. 3 into it. The several pits are in separate parallel lenses, lying partially one behind the other, and may come together and from one body at greater depth.

The company employ 150 men, and have in stock 17,000 tons of ore—all first-class. The drill holes that were made, and described in the last report, were too shallow. It is the intention to start the drill again and to bore deeper. In addition to the mining work the company have at the saw-mill 2,500,000 feet of logs.

Capt. W. H. Whiteside is still in charge of the mining work; Mr. Kirkpatrick, Agent.

The annual output has been as follows:

Years.	Tons.	Years.	Tons.
1871	4,171	1877	20,211
1872	39,495	1878	4,704
1873	41,204	1879	24,141
1874	16,106	1880	38,597
1875	4,070	1881	39,273
1876	15,324	1882	40,590
Total number of gross tons			287,887

THE WHEAT MINE

Is doing very little; are working only in one pit, and employ a force of 18 men, and have about 3,000 tons in stock of hard ore, and at the hematite mine about 1,000 tons. They have sold 1,800 tons to the Bellair nail works, Wheeling, Va. They are taking out about 60 tons per week. The hematite mine is not working, though it is looking tolerably well; but the company were afraid that the ore could not be sold this season, and so shut down.

The hard ore mine is not looking very favorably; the ore deposit in No. 1 shaft, the one they are working, is contracted, and it looks like a sharp contest between the rock and the ore which shall hold the day. A good deal of rock is mined to get what little ore is obtained. They are underground about 100 feet from the bottom of the open pit. No. 3 shaft is 130 feet deep, and they have an ore deposit at the bottom of it 5 feet wide.

The Agent is J. T. Haze, Negaunee, Mich.; Mining Captain, Thomas Prout.

The annual output has been as follows:

Years.	Tons.	Years.	Tons.
1879	850	1881	9,040
1880	3,324	1882	9,554
Total number of gross tons			25,989

THE NORTH RANGE.

MAY, 1883.

With the exception of the Beaufort and the Titan all the mines in the north range, in the vicinity of Michigamme lake, are idle. These mines are, commencing at the most easterly one and naming them in the order in which they occur, the Mesnard, Jim Pascoe, Daliba, North Hampton, Marine Farm, Webster, Beaufort, and Titan. The two latter are now working, all the others are idle, and have been so since the close of navigation last fall. Some of these that are idle are important mines, and the sole reason that they are not working is the fact that there is no market for the ore. There is little market at present for even the best ores, and it is to be expected that such ores as are produced by the mines in this range in this vicinity must, under a depressed condition of the iron market, be the first to go to the wall. The Beaufort and Titan have made sale of quite a large amount of ore, but it is to furnacemen who are also interested in the mines, and probably it is sold at a low price; but as they have, apparently, an enormous body of the ore, and it can be very cheaply mined, no doubt the companies can even then realize a profit; besides, it is understood that the conditions of the lease of the Beaufort require the corporation to pay royalty on at least 10,000 tons each year, so that they must pay the stipulated price on that amount whether they mine it or not, and thus this requirement may be a strong reason in determining the company to work the mine.

At this mine they have stripped the earth from the ore for a space of 150 feet east and west, and 50 feet north and south, and have sunk 15 feet in the ore, and are stoping on the south, east, and west sides. The ore is reasonably free of rock, and requires but little picking over; the derricks on the north side of the pit, working the buckets, can hoist the ore and empty it directly into the cars standing on the railroad track. They are in condition to mine several hundred tons per day. The quality of the ore is low grade, a hematite 55% in metallic iron and high in phosphorus. Five thousand five hundred and forty-three tons of ore were sent from the mine last season. The openings of the

TITAN

Are but a few rods to the west of the Beaufort; the ore is identical, and they have an equally large body of it. No drifting or cross-cutting has been done on either property to determine how wide the deposit is. They have a foot wall of jasper, mixed with ore, which may not be the limit of the ore to the south, and to the north they have not yet reached the hanging wall. The arrangements for mining are of the same simple character as at the Beaufort. The mines have a branch from the main line of the M., H. & O. R. R., which starts a short distance west from the Spurr. The Titan is the most westerly of this range of mines. One thousand seven hundred and seventy-eight tons were shipped late last year.

THE WEBSTER

Is the next mine east from the Beaufort. Preliminary work was prosecuted here vigorously last summer, and the mine put into excellent shape for mining a large amount of ore. There is sufficient evidence that the mine will afford an abundant supply; 4,413 tons were shipped from the mine last year. The management devolves upon Dr. Northrop, of Marquette.

THE WETMORE.

The Titan, Beaufort, Webster, and Farm lie west from Lake Michigamme, and southwest of the Spurr mine. The latter is the most easterly one, and is at least fully as promising as any of them. If the ore were sufficiently low in phosphorus it would be a mine of extraordinary value; but, like the others of this range, it is an ore for which there is no present demand.

Mr. Ed. Wetmore, one of the parties chiefly interested, and who has from the beginning directed all the operations at the mine, kept a force of men at work throughout last season, until the winter set in, chiefly stripping, and he has now a large extent of the ore uncovered, and is fully in readiness to mine whatever amount can be sold. There is in any event but little gain, under the present condition of the mine, in mining the ore and placing it in stock, since it can be taken from the mine and put into cars or into ore pockets nearly as cheaply and readily as it can be taken from the stock pile and put into cars; certainly there is not enough difference in the time gained to pay the additional cost for rehandling. The property comprises the N. W. ¼ of Sec. 25, T. 48, R. 31; and the explorations that have been made were described in the last report. The developments so far show an extraordinary amount of ore that can be very rapidly and cheaply mined. East of Lake Michigamme and north of the M., H., & O. R. R., a mile or so from the station at Champion, are located the other mines of this range, of which mention has been made. Of these the Daliba and Jim Pascoe have an abundance of ore, the others are still doubtful; at least the showing is not such as to warrant the assumption that they certainly have a sufficient body of ore, even of the quality that these mines afford, to be made successful.

THE DALIBA IRON MINING COMPANY

Hold the S. ½ of the N. W. ¼ and N. ½ of the S. W. ¼ of Sec. 29, T. 48, R. 29 W. The general features of the mine have been described in previous reports, and there is nothing further to add beyond the fact that the openings have enlarged to the extent necessary to the production of the large output of last year. The Daliba is the oldest of the mines of this range in this locality. It has made large annual shipments, so that its ore has been on trial in the furnaces. The mine is still, apparently, in condition to afford as large an annual product as heretofore whenever buyers can be found for it. The mine was shut down at the beginning of winter, and there is no probability that work will be at present resumed.

There have been shipped from the mine as follows:

Years.	Tons.	Years.	Tons.
1881	10,986	1882	44,836

Total gross tons	55,822

The officers are James H. Daliba, President, Cleveland, Ohio; W. S. Pollock, Treasurer; Walter Fitch, Agent.

East of the Daliba is

THE JIM PASCOE,

Which in 1881 made a great stir in iron mining circles; the stock ran up to $15 per share, and it was heralded by some enthusiastic, or not over scrupulous parties, as the most extensive iron ore deposit ever discovered on Lake Superior, and the prediction made that in a short period it would eclipse all other mines in the country. In point of fact it proves to be about on a par with the others that have been mentioned. It has, unquestionably, a large amount of this low grade, high phosphorus hematite ore, for which there is no market in any depressed condition of the iron trade; nor can be until some available process comes into general use in iron manufacture for cheaply eliminating the phosphorus. Eighteen thousand eight hundred and eighty tons of ore were shipped from the mine in 1882. There is no prospects of any shipments being made or of any mining work being done during the present year.

Thus far the Boston is the only hard ore vein that has been discovered in this range.

THE BOSTON (APRIL 30TH)

Still sustains its reputation for the quality of its ore, which is lowest in phosphorus of any hard ore in the State, and equally high in iron with the best. Some noticeable improvements have been made at the mine within the year past; among these are the addition to the mining plant of a new Norwalk compressor and several air drills. Three large frame houses have been built, which, in addition to those which they previously had, make ample accommodation for the men and families. All of the buildings have been painted, and thus improved in appearance. In the mine the buckets and derricks in the west end of the mine have been dispensed with, and now instead of three shafts, as heretofore, operated in this way, they have but one shaft, formerly the No. 3, and this is provided with a skip road, and the single skip does the hoisting with far greater facility and convenience than it was formerly done with the three. This new skip road works very nicely, and is just what was needed. The shaft house built over it is of dimensions calculated to suffice for a double skip road; but one is amply sufficient for present purposes; it is 215 feet in depth. Jasper shaft, which is 387 feet east from the west line of the property, is also now used for hoisting; it is at about the same depth as No. 3. The pit at the bottom of the jasper shaft is 75 feet in length, with a heading of jasper at each end.

The run of ore is lengthening in the pit since it is cutting under the jasper at the west, and the pitch of the ore in the bottom is to the east; at least all the "slips" are sharply in that direction. It is thus possible that it may lead to the ore cutting out the jasper to the east also. It is nearly certain that the ore must soon connect under this jasper pillar, which now separates the two pits, as No. 1 drill hole, bored two years ago, passed directly beneath this pillar, 225 feet below the surface, and cut 10½ feet of first-class hard ore, measured at right angles to the walls, and thence, after passing through a belt of jasper, cut 12 feet in thickness of good hematite ore, that gave, on analysis, 59% of metallic iron, and a trace, only, of phosphorus. The drill core of the hard ore in this hole gave of phosphorus .006 of one per cent, and metallic iron, 67.12%; silicon, 1.62%.

If this jasper wall does cut out, as above indicated it probably will, the Boston will have a fine run of ore from the west line of the property to a distance of 50 feet east of jasper shaft; a length of stoping ground of 440 feet, which will enable them to get out 5,000 tons of ore each month very easily. The vein was proved for a length of 1,140 feet, by boring through the formation at four different points. In these holes a width of the hard ore vein was found of from 10½ feet to 14 feet in thickness. The entire length of the ore vein on the property is upwards of half of a mile. They have a fine stock pile of ore at the mine of 10,000 tons, and are mining 2,700 tons per month—the April product.

A cross cut has just been started in the mine to the north to reach the hematite deposit, with the view to proving it and mining it, tramming the ore out through the cross cut to the shaft.

Mr. Fred. A. Wright remains agent of the company, and under his intelligent supervision, assisted by Mr. Joe. Sellwood, as superintendent, the affairs of the mine are sure to be ably managed.

The Boston has produced as follows:

Years.	Tons.	Years.	Tons.
1880	6,478	1882	18,077
1881	14,824		
Gross tons			39,379

THE STERLING MINE

is only separated from the Boston by the line which divides the properties. They are in the same vein and contiguous, so that in several places the workmen have broken through the partition and opened from one mine into the other. The ore is identical, though the stock pile of the Sterling shows a greater proportion of second-class ore than does that of the Boston. This second-class ore has a small mixture of jasper; it comes mainly from along the foot-wall. The best ore, that which is free from rock, is near the hanging wall. The mine is deeper than the Boston, being 240 feet deep. They are working two stopes, and have drifted west from the line a distance of about 250 feet. The ore in the west end, however, is a good deal mixed with rock, and the vein is narrow. Next to the Boston it holds a good width, and is free from rock. They are restricted in their work to one small bucket shaft near the east line. No recent change has been made in the surface arrangements.

The product of the mine was:

Years.	Tons.	Year.	Tons.
1880	1,197	1882	7,235
1881	4,702		
Total gross tons			12,134

The Boston and Sterling lie two and a half miles northeast from Clarksburgh station; the latter property being the W. ½ of the S. W. ¼ Sec. 38, T. 48, R. 28. G. W. Reed, Agent.

THE DEXTER AND THE DEY MINES (MAY 1ST)

Are situated about two miles east of the Boston and Sterling, and like them, are opened on adjoining properties and near the line which divides them—the Dey on the east and the Dexter on the west. Each has one shaft; they are sunk from the surface from the north slope of the hill at an elevation of about 40 feet above the level ground below to the north. The ore deposit, running east and west, lies under this lower ground covered with a depth of 60 feet of drift. An attempt was made by the Dexter company to sink through this overlying drift to the ore, but the quicksand was met with to so great an extent that the work was abandoned, and the shaft was sunk in the rock to the south, following the dip to the north. The inclination starts at 75°, but becomes flatter as depth is attained. The shafts are 150 feet deep, and from the bottom cross cuts are made to the ore to the north. In the Dexter this cross cut is completed; is 60 feet in length from the shaft to the ore, and they have also drifted west above the ore 50 feet, and to the east in it 150 feet, as far as the line, but they will continue drifting east beyond the line in the Dey, as it is the intention to connect the two mines underground, in order to secure ventilation. They have taken out about 500 tons, and that which they are now hoisting has the appearance of being good ore—a clean, uniform, brown hematite. They are mining about 400 tons per month. The deposit is 16 feet wide, and free of rock. It certainly has a very promising look, and there is thus far every assurance of having a good mine. The shaft is worked with a small engine and winding drum. A good boarding house has been built, and some other minor improvements made.

At the Dey the cross cut drift from the bottom of the shaft to the ore is in 30 feet, and they estimate that there is 50 feet more to drive to reach the ore. The hoisting is done with a horse-whim, though something more expediting will soon be procured. The shafts are advantageously situated for handling the ore, since the descent to the north gives sufficient elevation for ore pockets and stock piles, etc.

There is no swamp land in the vicinity, and the location will be a dry one. A branch from the M., H. & O. R. R. will soon be built to the mines.

Mr. F. A. Wright, the same gentleman who has heretofore been mentioned as agent of the Argyle and Boston mines, is also agent of the Dexter and the Dey.

THE ST. LAWRENCE MINE (MAY 1ST)

Is a promising hard hematite deposit, which has been opened during the past year. It is situated about three miles northwest from the city of Ishpeming in Sec. 5, T. 47, R. 27; the company holding on a lease 80 acres in the northwest quarter. A branch from the C. & N. W. R. R. has been extended to the mine. The ore deposit extends east and west, and dips to the south at an angle of about 70°. It has an apparent width of about 15 feet. It is covered with about 15 feet of sand and gravel, which has been removed for a length of about 200 feet. They are mining in two open pits, that are separated by a pillar of ore, and are stripping to the east for a stope. The pits are 30 feet deep, and in the bottom of the east pit they are sinking for a stope. The west pit is but a short distance from the west line of the property. Work for the season has but recently begun, and about 500 tons of ore have been mined and placed in stock pile. They have sold 10,000 tons, and design to mine all the ore they can this season. It will be very cheaply mined, and be dumped directly into the cars on the railroad track, which runs along on the south side of the mine. The ore is low grade, 53 to 57% metallic iron and .086 to .104% in phosphorus, with quite a percentage of magnesia. The sale of the ore is to one of the owners, who uses it in his furnace. The present force employed is 25 men. The walls of of the ore deposit are jasper, foot and hanging apparently the same, which at the surface are much broken up, and show little tenacity, but deeper they appear to be firmer. The hoisting is done with two derricks and buckets worked with an engine and drums.

The superintendent is J. R. Wood, formerly of the Cornell mine, assisted by his brother, J. S. Wood, who is at present directing the work.

The St. Lawrence is the most easterly of the mines in the so called north range. The mine shipped last fall 9,992 tons of ore.

THE HUMBOLDT MINE (MAY 3D)

Shows very little change, either for the better or worse. The mine is deeper, of course, and in the main pit there is an improvement in length. The work is now all confined to two shafts, No. 2 and No. 3; No. 1 has been abandoned, and also the small pit in the south slope of the ridge further to the east from the mine. No. 2 and No. 3 shafts are 280 feet deep, dipping to the northwest. The hanging wall is a very singular conglomerate, mainly a talcose schist, impregnated with quartz, pebbles, and pieces of ore. At this mine it forms a wide belt, and upon the surface are seen immense boulders or fragments of the same rock to the north of the mine. It seems to be of limited extent east and west, since it cannot be traced to any great distance in either direction. There are facts, particularly the magnetic attraction, that indicate that the ore formation at this mine makes a sharp bend at the west end of the mine to the north, so that the dip of the ore, if it exists, in the opposite bluff may be to the east and south. However, nothing of this kind has been certainly determined, beyond the fact that in the west end of the mine the upper drift in the bottom level which follows the ore curves sharply to the north.

The shafts are both in the same pit and not far apart. The whole length of the ore in the bottom is about 300 feet. A favorable feature is the fact that it has lengthened 90 feet in the last year. Between the shafts the deposit is wide, narrowing up at the ends until it is merged into jasper. The ore is of good quality, hard slate and magnetic, high in metallic iron, but averaging at slightly too great a percentage in phosphorus for Bessemer pig.

Mr. Maas, the agent, has a diamond drill at work in the hollow between the railroad and the highway, at a considerable distance east of the mine, to further prosecute some explorations previously made at this point. They designate the present mine as the Barron in distinction from the old mine, now abandoned, which is about a mile east from where they are now working. The company have 16,000 tons in stock, and work 160 men.

The product for past years is as follows:

Years.	Tons.	Years.	Tons.
1865	4,782	1874	27,890
1866	15,150	1875	9,642
1867	25,440	1876	3,333
1868	35,757	1877	16,546
1869	58,462	1878	23,921
1870	79,712	1879	18,204
1871	48,725	1880	14,727
1872	38,841	1881	26,302
1873	38,014	1882	43,436
Total gross tons			528,933

John B. Maas, General Manager; John Hosking, Mining Captain, Humboldt, Mich.

THE ARGYLE MINE (MAY 3D, 1883)

Is situated about half of a mile east from the Humboldt. It is an old mine, and the location is a pleasant one. Until two years ago it was known as the Edwards, when it passed under the control of the corporation that now owns it. The present mine cannot certainly be a very profitable one, the ore deposits which they are working are too small either for working to advantage or to afford a large product. But it is a good mine to explore, a good property to explore with the diamond drill, and it is stated by the local officers of the company that it is the intention to bore with the drill in the bottom of the mine to the south in the foot-wall without delay, and also from the surface north of the mine.

A small amount of drill work has been done in the mine heretofore, and 14 feet of ore penetrated after going 60 feet into the foot-wall. A cross cut has just been driven to this ore, but it has not yet been opened out. The mine is so small that it requires constant sinking in order to have any stopes, and the result is a rapid increase in depth. No. 3 shaft is 600 feet down, on the lay, and No. 2 is 500 feet deep. They are only connected by drifts in the upper levels, below a bar of rock separates them. The mine is a succession of small lenses or pockets of ore, lapping each other and separated by bars of rock, that have also to be mined out; thus necessitating a too large proportion of dead work in mining and hoisting rock. They now work about 40 men, and are mining 400 tons per week. The stock pile contains about 10,000 tons, which is now shipping. It requires careful picking to make it first-class. The ore is slate and magnetic, averaging 65% in metallic iron, and slightly too high in phosphorus for Bessemer pig. A recent sale of some of the ore has been made to the Vulcan furnace company.

A change has lately been made in the local management of the affairs of the mine, and the company are fortunate in securing the services of Mr. Fred. A. Wright, as agent, and Joe. Sellwood for mining superintendent. Mr. Wright is a very reliable, clear headed business man, and the latter has had a long and successful experience at the Cleveland mines and elsewhere in directing mining work. If given an opportunity these gentlemen are sure to do some practical exploring work, and to do it intelligently and economically. Such efforts will go far towards determining the value of the property.

The mine has produced in past years as follows:

Years.	Tons.
1866	2,843
1867	4,928
1868	17,360
1869	21,450
1870	24,232
1871	26,437
1872	26,026
1873	39,281
1874	2,844
1875	12,804
1876	19,420
1877	10,591
1878	10,303
1879	5,455
1880	------
1881	4,584
1882	12,461
Total number of gross tons	241,074

The officers are Don M. Dickinson, President; Sigmund Rothschild, Vice President; A. H. Dey, Treasurer; D. R. Shaw, Secretary; Fred. A. Wright, Agent, Humboldt, Mich.; Joe. Sellwood, Superintendent, Humboldt, Mich.; James Tundy, Mining Captain.

THE REPUBLIC MINE (MAY 17TH, 1883)

Has been very fully described in the previous reports, and in the last one the description written as late as June, 1882, describes the mine in detail, going through each of the shafts and pits in succession. Too few changes have been made within the year that has since transpired to render it necessary to repeat this description. It is almost superfluous to remark that the mine is as great as ever, and in condition to make its usual enormous product. In fact, it probably never looked better than now, or had a larger amount of ground opened for stoping. All of the 16 shafts or pits are working except No. 3, which has been merged into No. 5. They have all been sunk an additional lift and the three southwesterly pits, Perkins, Pascoe, and Morgan, have also been connected during the year, formerly they were separated by bars of ground. The Morgan has a double skip road, the Pascoe a single track, and the Perkins is operated with a bucket hoist.

The larger portion of the product is taken from No. 5 pit, which is the finest deposit of hard ore to be seen in the State. The shaft is nearly vertical to 530 feet in depth, and operated with a double cage going down through an ore deposit that has a width near the shaft of 150 feet from foot to hanging wall. Half the ore is required to be left in the pillars to support the roof. At some future time, if the bottom is ever reached, these pillars may also be mined out, rising up from the bottom and filling the mine with rock obtained from the surface. The product is fine specular slate and black magnetic ores, but they occur in the pit in entirely distinct deposits, resting one against the other without mixture or separated by a partition of soap stone—talcose schist. They are mined and hoisted separately, and run to distinct pockets and stock piles. This pit, as well as the others in the mine, is as nearly as may be the exact counterpart of what it appeared a year ago, except that we go down an additional level to witness the main work of stoping.

The company met with a misfortune not long ago in the burning of the compressor house at the dam on the Michigamme river; a new one on the same site is now, however, nearly completed, and greater precaution has been taken in its construction to avoid the liability of fire. The new building is furnished with an iron roof, and the side next to the boiler house is covered with corrugated iron; on the inside the rafters are left naked, as in the one burned the fire ran between the ceiling and the roof and could not be reached with the hose to extinguish it; such a recurrence they propose to avoid. The loss of the compressor house afforded the company an opportunity of realizing the great value of power drills in mining work; they were able to nearly keep up the product, but at a greatly increased cost.

The most important improvement made during the year is the new engine house and the hoisting plant, electric engine and boilers contained therein; it, altogether, is one of the best to be found in the iron region, and is an addition that the mine very much needs. The location of the building is east of No. 5 shaft above it on the solid ledge; it is built of stone with iron roof, and is very substantial and a fine looking building for the purpose intended. Its size is 78 feet by 98 feet. The main room contains the four large hoisting drums and two engines. The drums are each 12 feet diameter and 6 feet face, internal friction gear, made at the Marquette iron works. They are set with great care on the most solid foundation, and when started for trial worked perfectly. They will be used to work Nos. 5, 6, and 7 shafts. They are now at work changing the east half of No. 5 shaft; will take out the cage and put in a double skip road for hoisting ore. The west part of the shaft will be used with the cage, as heretofore, for the men and for timber.

Electric lights have not previously been used at the Republic, but they now operate eighteen, all on the surface; none are in use in the mine. They have but recently gone into use, and they find them a great convenience in facilitating the night work. The new boilers are three in number, are each 78 inches diameter, 62 feet long, and contain 82 four-inch flues. They proved a great help in the recent emergency, when the compressor house burned, as within 24 hours thereafter steam pipes were attached to the underground pumps and connected with the new boilers, which were in readiness to start, and the pumps were thus run by steam power instead of air, which had been cut off. Without these boilers they would have been in an embarrassing situation, as there would have been no available power on the location to run the pumps.

They are laying the foundation for a new office near the old one, which, when built, will be much more commodious and adequate to the wants of the company than is the present one.

They operate 22 power drills; employ an average force of 700 men, about 500 of whom are miners and underground workmen. The product is now 800 tons per day, and on the first of May there were in stock 105,000 tons of ore. Several train loads per day are now sent to Marquette from the mine.

Mr. W. D. Rees, the assistant general manager, severed his connection with the management of the mine the first of May instant, and Mr. David Morgan, who has for some years had the chief direction of affairs, retains now the sole charge. Capt. Peter Pascoe, who antedated them all in service of the company, having done the first work and originally opened the mine, still continues in his position as mining superintendent. He takes the same pardonable pride in showing the mine to an appreciative person that a prosperous country gentleman does in showing his well improved estate.

The annual product of the Republic mine has been as follows:

Years.	Tons	Years.	Tons.
1872	11,025	1878	176,221
1873	105,453	1879	135,131
1874	122,639	1880	235,387
1875	119,726	1881	233,651
1876	120,095	1882	235,108
1877	165,836		
Total number of gross tons			1,660,292

A remarkable fact connected with the mine is that up to the present time (May 17) not a ton of the ore has been sold, the first instance in the history of the mine where the entire season's product has not been contracted before the earliest shipments began. It is generally thought that when Republic ore wont sell there is no use for any other mines to try to sell.

THE WEST REPUBLIC MINE

Is no doubt somewhat of a disappointment to the more sanguine shareholders, who two years ago invested in its stock at pretty large figures, anticipating that ere long it would rival its formidable neighbor, the great Republic. Still the West Republic has proved to be about what its surface exploration showed, and has grown neither better nor worse. They built up too much on anticipation, and possibly were given, when looking at the comparatively limited showing, to glance over to the stock piles that loomed up on the opposite side of the bay. It is not easy to see into the earth, particularly when the rock formation is so broken up and contorted as it is in this locality; but it is the simpliest thing in the world to conjecture and to anticipate a result that runs with our wishes. The ore being a fine, specular slate, identical with that at the Republic, and contiguous to it, it was but natural to project the other parallel, and assume that there was a like quantity of it. So far, however, such has not proved to be the case. The ore lense is short, and they have of necessity gone down pretty rapidly. Last year the depth increased 100 feet, and the mine is now wholly under the river. They really have two lenses, which near the shaft are not far apart, but radiate from each other as they extend west. The south lense is wholly west of the shaft, and is the longer, but it is narrow, not above 6 feet wide, and terminates in jasper. A drift from the west end is extending under the river to the west side, where a shaft has been begun to sink to meet it. The shaft is only to the ledge. The end of the drift is 230 feet from the shaft, and is all in rock with occasional seams of ore. The north lense has a good width but is short, not above 70 feet in length. The lower level where they are now stoping is 335 feet below the surface, the dip is slightly to the northwest. To keep up the stopes requires constant sinking, and last year's product of 27,865 tons carried the mine down, as before stated, 100 feet.

The surface arrangements are excellent; the ore pockets and stock piles could not be more conveniently placed with reference to the shaft and for loading into cars. They have a good hoisting plant, engine house, shop, office, and a number of good houses. A number of deep borings have been made with the diamond drill, mainly on the opposite side of the river, but no ore was found, after passing through quartzite, instead of ore, they came to granite. The same result was met with by the Republic company boring further west. East of the mine, next to the Republic, a boring was made and some ore was found, and this locality may be further investigated. The mine is in Lot 4, Sec. 7, T. 46, R. 29.

Capt. Mitchell still directs the mining work under the Superintendent, James O. St. Clair. General office Cleveland, Ohio. Mark Hanna, Secretary and Treasurer.

The company now have 10,000 tons in stock (May 17th,) which they have begun to ship. The present force employed is 100 men. None of the ore has been sold.

The mine has been worked two years, and the annual product has been:

Year,	Tons.	Year.	Tons.
1881	7,378	1882	27,865
Total gross tons			35,243

THE COLUMBIA MINE,

Lying north of the Republic on the opposite side of the river, has been idle since the opening of winter, and it is stated as uncertain when work will be resumed, perhaps not at all. The company has met with little to encourage them to prosecute work further at this mine. The ore lenses are small and contracted, and the ore is mainly second-class, hard slate ore. The mine affords very little, if any, strictly first-class ore. It has been very fully described in previous reports.

Mr. C. M. Wicker, Republic, Mich., is still general manager for the company.

The mine has produced as follows:

Years.	Tons.	Years.	Tons.
1873	21,271	1878	------
1874	34,348	1879	------
1875	8,059	1880	6,636
1876	------	1881	11,158
1877	------	1882	12,066
Total gross tons			93,535

THE ERIE MINE

Is situated about five miles to the northwest in the same range with the Columbia in the N. E. ¼ of the N. W. ¼ of Sec. 28, T. 47, R. 30. During the last season a branch of the M., H. & O. R. R. was extended to the mine, and ore to the amount of 2,730 tons was shipped.

The company continue to work in the same deposit from which this was gotten out, and now have in addition about 5,000 tons in stock ready for shipment. The workings have reached a depth of about 100 feet vertically down, and the ore has been all taken out. The deposit has a length of 50 feet, which, at the northeast end, has a width of about 14 feet of mixed ore and rock. In the southwest end it is equally mixed, but the rock varies in character, as does also the ore, throughout the deposit. In the bottom there is a small shoot of soft, fine slate ore, similar to the best Champion, but the predominating variety is a specular slate, similar to the Republic ore, but with numerous concretions of birds-eye quartz, that renders the ore second-class. There is not enough of first-class ore in the mine to indicate that the company can establish a grade of that degree. The deposit is small and mixed, and is all worked out from the surface down to the present bottom.

E. H. Wright, Agent, Republic, Mich.

THE SPURR MINE.

No doubt but the owners of the Spurr mine would be glad to find a good body of ore in addition to the limited deposit in which they are now working, but they fail to take the steps which have generally been found necessary to make such a desire a reality. There are several important mines in the country which could have made no better showing than the Spurr makes if they had made no more of an effort in the way of exploration than is made at the Spurr.

The owners might, one would think, consider with advantage the example of their neighbor, the Michigamme Company, and observe the important success which has attended their efforts in boring with the diamond drill. It is very possible that at the Spurr also, in the foot-wall, or in the hanging-wall, or in both may be inclosed lenses of ore far greater than the meagre one which they are now mining. A few borings with a diamond drill would go far toward determining the matter, and a little judicious exploration for this purpose would certainly be true economy; it is a matter of surprise to every one acquainted with the mine that it is not done. Until something of this kind is done that shall lead to the discovery of more ore than they now have, the mine cannot amount to much. The work is confined to a short pit that has been constantly becoming abridged, being cut off at both ends by rock which on the west side has gradually approached the shaft until now in the bottom it has cut across it so that the bottom of the shaft is in rock, leaving but a small triangular prism of ore to take out to complete the stoping west of the shaft.

East of the shaft in the lower level, they are now drifting in ore under the rock that has heretofore cut off the vein in this direction, and are at present 79 feet east of the point that constituted the limit in the levels above. This fact is a very favorable one for the mine, since otherwise it would be nearly at the limit of its working. The breast of this east drift is still in ore and the vein holds in width, having an average of about 10 feet. If it continues they will have to sink No. 2 shaft, which is further to the east and is down a short distance below the surface. No. 1 shaft being now in rock and altogether west of the ore, it would be hardly desirable to sink that further at present; its depth is about 400 feet. The company have sold 10,000 tons of ore and have 7,500 tons in stock. They can mine about 2,000 tons per month. The force employed is now 40 men. The location of the Spurr mine is a pleasant one, a good deal of surface improvement has been made, there are a number of good dwellings for miners, and the machinery is also ample for a much larger mine than they now have.

The description of the land owned by the company is the N. ½ of the S. W. ¼ and the S. ½ of the N. W. ¼, of section 24, T. 48, R. 20. The officers are H. C. Pulling, President; W. D. Wisson, Secretary and Treasurer. Office, Detroit, Mich. W. D. Davis, Agent, Spurr Mine.

The product of the mine in gross tons is as follows:

Years.	Tons.	Years.	Tons.
1873	31,933	1878	2,225
1874	41,765	1879	1,409
1875	23,095	1880	-------
1876	20,276	1881	2,746
1877	22,801	1882	8,872
Total gross tons			155,122

MICHIGAMME MINE.—(MAY 12TH, 1883.)

Few mines in Marquette county show greater recent improvement in their prospect for the present and the future than does the Michigamme, and the important developments which have been made illustrate the value of explorations in a hard ore mine, which may be made with a diamond drill when intelligently used. The discoveries of ore which have lately been made in this mine are due to the application of the drill.

About a year ago Capt. Christopher began boring to the north through the foot-wall, in the west end of the sixth level, 324 feet vertically below the collar of No. 4 shaft, and at 120 feet a body of ore was found to which a cross-cut was driven, following a drill hole. In this ore an opening has been made 220 feet in length, with several stopes each way from the drift; measured horizontally, from foot-wall to hanging, the new vein is 27 feet wide, in the center of the opening; the dip is about 62 degrees. The product is of same quality as heretofore found in No. 4 pit—hard specular ore—and Magnetic. In the level above but further to the east, a second drift has been made to this body of ore, and here, too, considerable progress has been made in mining it; the deposit proving to be equal in dimension as found below. The great want felt is a shaft from the surface into the newly-opened deposit, for ventilation and for hoisting—a necessity that it is the intention to meet as speedily as possible. At present the ore is trammed out through the drifts to No. 4 shaft, which is thus greatly overburdened, since the regular work of No. 4 pit, in the old vein, is fully sufficient for the capacity of the shaft. Ventilation is secured to a degree sufficient to render the situation tolerable in the new mine, through a winze from the upper to the lower opening. The diamond drill is now working in the seventh level, in the east end, where the rock had cut out the ore. A series of holes has already been made at this point, extending to the east and to the south, one row of holes reaching out into a horizontal plane and another below at an angle downward of about twenty-five degrees. In all of these borings, after passing through about 26 feet of "green rock," ore has been found varying in extent, as shown by the holes, from 20 to 51 feet. The ore is of the best quality ever found in the mine. The discovery is a very fortunate one, as the east end was looking very dubious, but now they are assured of having ore in a greater quantity than would have resulted from a continuance east of the old deposit. Several levels above this point east from the bottom of No. 3 shaft, the foot-wall had apparently come in and cut out the ore, but by working south into the hanging-wall, the ore is found in a large body, and they have drifted through and are now sinking a winze in it, and the outlook at this point is very favorable, where but recently the ore appeared to have become exhausted. The plan is to sink No. 3 shaft to the bottom, and to use it in working the east end of No. 4 pit.

No. 1 and No. 2 shafts remain about the same as heretofore; they are both small pits and afford but limited stoping ground, but from each a few thousand tons of ore is annually obtained. In the bottom of No. 1 they are just now mining a red martite ore, into which they have recently come, and the indications are favorable for an enlargement of the deposit.

No. 1 shaft is 500 feet from the lake, and from it to the west end of the mine it is 28,000 feet. The west shafts—Nos. 5, 6, and 7—are 400 feet apart and are idle; the water, however is kept out of No. 5 with the view of working it in connection with the new north mine now reached by the cross-cuts from No. 4. No. 4 shaft is about midway between the extreme east and west ends of the mine, and has for years been the main productive portion of the mine. It is about 530 feet in depth on the lay of the deposit; dipping, average 61 degrees 40 minutes, to the south. The length of the ore deposit in this pit is about 400 feet, and the average width about 10 feet—much wider in some places and narrower in others. Below the level in which they are now mainly stoping, the shaft has been sunk another lift and the side winzes also sunk ready for stoping, when the level above is sufficiently exhausted to require it.

No. 3 shaft is 196 feet east of No. 4, measured on the surface, though the two shafts approached each other in their descent, being only 171 feet apart at the bottom of No. 5—160 feet, vertically down. Attempt has heretofore been made to lower this shaft below its present bottom, but they failed to find the workings beneath, into which it was desired that the shaft should extend, with the drill, owing to the probable fact that the foot wall changes and makes off very flat to the south; they have followed the hanging. If the shaft were opened to the bottom of the mine and in working order it would be of great advantage, since now everything—ore, rock, timber, drills, etc., must be passed through No. 4 shaft, which has only a single skip road, and is far from straight. A good deal of delay and inconvenience naturally results from being thus restricted. A survey has been made to determine the direction that must be given to No. 3 to insure its reaching the point desired, and the work of continuing it will be speedily prosecuted. The ore from the winze now sinking to the east of the shaft is hoisted in a bucket through the shaft.

No. 2 shaft is 575 feet east of No. 3. The intervening ground has not been worked with the exception of a shaft 80 feet deep, 160 feet west from No. 2. This was started to reach a body of ore that had been discovered with the diamond drill; at present it is expected to reach the ore thus found from No. 2, working west. No. 2 pit is somewhat of a singular, contracted affair, presenting many perplexities: the bottom extends west from the shaft 100 feet, and is still pushing on; further up in the pit it has been opened to a distance of 160 feet west of the shaft. At this point, a short distance west of the shaft, occurs an island of jasper in the vein, connected lower down with the foot-wall, but at the top the ore has been beaten away on all sides of it. Standing on it one sees a chasm all around him. At the bottom, east of the shaft, the length of the ore is about 40 feet. The ore holds good in the bottom but does not increase in length. Further up in this pit, to the east, the ground has all been beaten away, leaving only pillars, for 150 feet to old No. 1 shaft. Into this latter abandoned shaft the waste rock is dumped and it is already pretty well filled up. One hope of No. 2 is to reach a body of ore to the west, that as before stated was penetrated with the diamond drill. The shaft is 225 feet deep, inclining south 61 degrees 30 minutes.

No. 1 shaft, formerly called the Barnum, is 278 feet east from No. 2. It has frequently presented features that excited hopes of good results, but has on the whole been a disapointment; the length of the bottom is about 90 feet and the ore occurs mainly to the east of the shaft. The shaft is 220 feet deep on the lay. With the exception of No. 3 the shafts are all provided with skip-roads and are worked from the main engine house. No. 3 has a small separate hoisting plant. All but No. 1 are furnished with air pipes and power drills.

The main engine house is a substantial stone structure, one of the best in the iron region, situated 150 feet west of No. 4 shaft between Nos. 5 and 6. It contains the hoisting machinery, compressor, etc. The latter is the National, capable of operating 27 power drills; 13 are now in use. It also works several pumps and small hoisting engines, used underground. In fact it is just at present overburdened. The drills are Rand No. 3; formerly they used the No. 2, and a few National drills, but they were exchanged for the present drills, the makers allowing $100 each for the old ones. The company will immediately begin to sink a new shaft between No. 4 and 5 to reach the new deposit north of No. 4. The extent of the sinking will be 254 feet at an angle of 62 degrees and 30 minutes, south from the horizon. The present force is 300 men and there are about 25,000 tons now in stock, the shipping of which has just begun. Mr. J. C. Fowle, the superintendent of the mine, to whose intelligent management the present favorable outlook is largely due, is to be congratulated upon the success of his efforts.

The Michigamme mine has shipped as follows:

Years.	Tons.	Years.	Tons.
1872	141	1878	58,622
1873	28,966	1879	56,935
1874	45,218	1880	52,944
1875	44,756	1881	57,115
1876	70,074	1882	43,712
1877	28,238		
Total gross tons			486,721

The officers are Wm. H. Barnum, President, Lyme Rock, Conn.; James Rood, Secretary and Treasurer, Chicago, Ill.; I. C. Fowle, Superintendent, and J. P. Christopher, Mining Captain, Michigamme, Mich.

THE CHAMPION MINE (MAY 14TH, 1883)

Has great advantages, and in every particular it is one of the best iron mines in the State. It is one of the largest producers, and its ores are among the richest, hard specular slate and magnetic that are found in the region; they command the highest market price, and are among the most eagerly sought for. The extent and situation of the ore deposits, the firmness and stability of the walls, the excellence of the management, and the skillful direction of the mining work, have reduced the production of the ore to the minimum of cost, and to the maximum of safety.

The gain in the length of the ore deposits in the last year are precisely what was anticipated would occur, at least the favorable result is a matter of no surprise. It is naturally a gratification to have so fortunate a verification of what had been previously determined should occur; a contrary result would have been a disappointment.

It will be remembered by those who are familiar with the mine that the ore deposits are in two distinct lenses, lying east and west, parallel with each other, and separated by about seventy feet of rock, and known as the north and the south deposits. The shafts go down in the north lense, and the south one is reached by cross cuts through which the ore is trammed out to the shafts. These ore deposits are limited to the east by the rock, which has extended downward from the surface with an inclination to the west, but they underlay to the west indefinitely; so that with each successive level there is a great gain in length. In the last year the 7th level has been stoped west to the end, and the gain in length beyond the length of the 6th level is 112 feet. The length of the ore in this level in the north deposit is 570 feet, and its length in the south deposit is 500 feet.

The 8th level has been extended west beyond No. 4 shaft 50 feet. Thus far No. 4 shaft has not been sunk, they have stoped west from No. 3, leaving only pillars, and put in the skip road for No. 4 through the openings. Hereafter No. 4 will be sunk, and will have side pillars, and will be the main shaft of the mine, taking the bulk of the ore. No. 3 shaft is down to the 10th level and in the rock that finally crosses it, and it will not be sunk any further.

In the 9th level they have opened 200 feet in length, 60 feet to the east and 140 feet west of No. 3 shaft. In the south deposit in this level the openings extend 44 feet west and 90 feet east from the shaft, and in the 8th level in the south deposit they have stoped to within 60 feet of the east end, which is all that is left in this level in this deposit.

In the 9th level, in the south deposit, a winze has been sunk to the 10th level, and a cross cut made north to the shaft. This gives a very large amount of ground opened for stoping—two deposits, each 500 feet in length and upwards, and 16 feet in width, with firm walls and separated by a partition of 70 feet of self-sustaining rock.

No. 4 will soon take the bulk of the mine, and after many years of continuous work, it will in like manner be transferred to No. 5. Realizing this fact, No. 5 shaft has been pushed down from year to year, while, otherwise than for this ultimate use, there has been but little inducement for so doing; much of the way there has not been ore enough found to any more than pay the cost of obtaining it. What ore was found in the north deposit was entirely exhausted in the 4th level, so that thence downward the only product came out from the south lense. Very recently, however, there is an important change for the better. The shaft is sunk to the 7th level, and in ore, and in the south lense a winze has also been sunk from the 6th to the 7th, and a cross cut made from the bottom of it to the shaft; in making this cross cut they found the ore to be 20 feet wide. Thus they have a good body of ore in the shaft, which has been, heretofore, wholly in rock.

In the 6th level, in the south deposit, at No. 5 shaft, they have opened 90 feet in length. The ore has a width of 12 feet. Also, as will be seen, they have at this shaft a large amount of ground opened for stoping—the entire body from the 6th to the 7th level in both lenses.

It is the intention, if the ore market does not improve, to stope only in the newly opened ground in this shaft and at No. 3, leaving the ore in the upper levels for the present. To get out a large product generally requires that as many stopes as possible may be worked, and for this reason, if the ore does not sell, they will avoid exhausting any of their stopes, reserving them for a time when there shall be a demand for ore.

No. 6 has not been worked for a long time, but, ultimately, it will be again started and pushed, on the same principle that No. 5 has been.

No. 7 has a body of ore underlying it, as shown by the drill, which passed through 14 feet of it. This ore is 80 feet below the bottom of the pit—220 feet below the surface. No attempt has been made to sink for it yet.

No. 3, which is the deepest shaft, is 600 feet below the surface, vertically down. The mine is increasing in magnitude, but as before stated, no more so than was anticipated, since the pitch of the lenses to the west has been pretty well determined with the diamond drill, and the developments from year to year are likely to be such as are mainly expected to occur.

The new compressor building has been completed, and like the main engine and boiler house, is of stone, and of the most durable character. The new compressor is a duplex Delameter; cylinders, each 20 inches by 40 inches, and works perfectly. To secure the requisite additional steam, two new boilers have been added to the four previously in use.

The total force employed is 400 men, and they are mining 6,000 tons per month. The stock piles contain about 50,000 tons of ore.

Mr. Alfred Kidder, who for many years has been agent of the company, unites with his thorough business qualifications an interest in mining work and an entire familiarity with the Champion mine, of which he is justly proud.

Capt. Jim. Pascoe, the superintendent, is again on deck, greatly restored by his winter's sojourn in the south. He is now able to take to the ladders and go through the whole mine, a task that exacts no small degree of endurance.

The Champion mine has yielded as follows:

Years.	Tons.	Years.	Tons.
1868	6,225	1876	66,002
1869	21,535	1877	70,883
1870	73,161	1878	73,764
1871	67,588	1879	93,203
1872	68,404	1881	112,410
1873	72,782	1881	144,025
1874	47,097	1882	157,516
1875	56,877		

Total number of gross tons 1,131,202

THE EAST CHAMPION (MAY 13TH, 1883)

Is still working in a small way. There have been no new discoveries of importance, and the mine has no large deposits of ore, so far as known. They are working in No. 2 and No. 3 shafts, in the latter the work has only been in the way of exploration. The shaft is 300 feet deep, and in the bottom of the pit they have bored with a diamond drill—horizontally into the foot wall—200 feet. A short distance from the pit they intersected a deposit of ore, to which they are preparing to cross-cut, but it is not known whether it is merely a small pocket or one of some size. Small lenses or bunches of ore have not been of unfrequent occurrence, but they are soon worked out.

They have also drilled to the south across the formation under this pit, 100 feet below the bottom, and found the ore, but not in great magnitude. Another hole has been started to cut the formation further to the east and higher up. The object is to catch the ore that was found in No. 1 pit, if possible.

No. 2 pit has improved somewhat; it is 150 deep, and the lense is about 150 in length, with a width at the west end of 8 feet, and at the east end of about 5 feet; it is increasing in length.

No. 3 pit has in the bottom about 6 feet of width of ore which added to the lense they are cross-cutting to will make the pit of some value, possibly of considerable value.

There are about 2,000 tons of ore in stock, and about 20 men are now employed at the mine.

A new Ingersoll compressor has been added during the last year, and three power drills are worked, a fourth one will soon be added to run the cross-cut in No. 3. The compressor has necessitated the addition of another boiler which is also in use.

The president of the company is F. B. Spear, Marquette : C. T. Hampton, Agent; Wm. Edwards, Mining Captain.

The mine joins the Champion on the east, and has yielded as follows:

Years.	Tons.	Years.	Tons.
1873	12,701	1878	5,401
1874	4,880	1879	4,029
1875	3,348	1880	10,221
1876	7,715	1881	3,408
1877	14,496	1882	3,713
Total product			69,912

The mine is the S. E. ¼ of the S. W. ¼, of section 32, T. 48, R. 29, being about a half of a mile from the railroad station at Champion.

THE TAYLOR MINE

Has closed down after working out all the ore in the mine. As it now stands the mine is exhausted, but it is very probable that further exploration may develop other deposits that are not known. The indications are favorable for it. They have 5,000 tons of ore ready for shipment from the mine. The location is the N. E. ¼ of the N. W. ¼ of Sec. 9, T. 49, R. 33, being seven miles west from the village of L'Anse.

The shipments have been as follows :

Years.	Tons.	Year.	Tons.
1880	1,110	1882	15,031
1881	9,488		
Total			25,629

THE SWANZY MINE,

Being, as will be remembered, an offshoot from the Cheshire mine, has been worked for the past two years with good results. The old Cheshire workings have been abandoned, and the only mining now done is at the Swanzy. The latter is in the S. W. ¼ N. E. ¼ of Sec. 18, T. 45, R. 25. They have worked out an open pit to a depth of 60 feet, and in the bottom have sunk a shaft 60 feet below it in the ore, which in the bottom of the pit has a width of 30 feet. The shaft is sunk for a stope, and to the depth to which it extends the ore will be mined out, leaving an open pit. The ore at the bottom of the shaft has been shown to be, by cross cuts, of an equal width as when worked out. The indications are all favorable for the continuance of the prosperity which the mine has thus far held. The mine is reached by a branch railroad, connecting at Cheshire Junction with the Peninsula division of the C. & N. W.

The officers are J. J. Pierce, President; J. F. Stevens, Agent; A. P. Wood, Superintendent.

The shipments of ore from the mine, including that also obtained from the Cheshire, which is held by the same parties and lies adjacent:

Years.	Tons.	Years.	Tons.
1872	13,415	1878	16,924
1873	9,329	1879	17,831
1874	------	1880	13,201
1875	188	1881	5,674
1876	225	1882	------
1877	8,423		
Total product			85,250

Swanzy product:

Year.	Tons.	Year.	Tons.
1881	9,337	1882	31,498
Total gross tons			40,835

THE MENOMINEE RANGE MINES.

THE VULCAN MINES (JUNE 1st)

Have undergone some improvements in the past year. No. 1 shaft, at the East Vulcan, has been sunk an additional distance of 120 feet, and lined up from the surface to the bottom, 350 feet, and provided with a cage, shaft-house, etc. The expenses incurred at this mine have been greatly in excess of the value of the ore obtained, but the mine has been put into good shape for future working, and should the company be fortunate enough to find sufficient ore, the mine is now in condition to be worked to advantage.

In the bottom of No. 1 shaft they have a lens of ore about 50 feet in length, and have run an exploration drift to the east, 360 feet, from the extremity of which they have driven to the north and south without any important results. They have also driven to the west of the shaft upwards of 200 feet in rock, and cross-cutted from the end to the south, coming into ore. They are obtaining, altogether, from this shaft, about 600 tons of ore per month. The officers at the mine regard the indications as favorable, and think that the new deposit which they have struck at the west and south will prove a valuable one, and in the end the East Vulcan will return to the company all that it has cost them.

At the West Vulcan the trestle work, 370 feet in length, mentioned in the last report as among the plans for the future, has been built, so that now all the ore from the several shafts is run out on this elevated track over the ore dock and to the pocket at the extremity over the railroad ; these pockets have a capacity of about 300 tons. The long drift from No. 2 to No. 3 shaft has been completed, 450 feet in length, so that now one can go through the whole mine without ascending to the surface after going down one of the shafts to the level of the drift. A stone house has been built, and in it placed a new pumping engine, which takes the water from the north mine. The water is drawn from the bottom to the level of the cross-cut by a 12-inch plunger pump and thence to the surface with a 10-inch plunger, and what the latter pump does not take goes over and runs through the cross-cut to No. 2 shaft where it is taken to the surface, in addition to the water made in the south mine, with a 10-inch plunger pump.

It will be remembered that the mine is in two distinct deposits extending east and west in the hill side sloping to the south, the one lying 450 feet north of the other. In the north mine are four shafts and in the south one two. The greater portion of the product is obtained in this south deposit in No. 1 shaft ; the out-put for May was 5,000, of which 4,000 were from No. 1. It was formerly an immense deposit, 90 feet in width, but has now narrowed down to about 18 feet. This narrowing was occasioned by the foot-wall setting off to the south into the ore; now, however, the walls are going straight down, and the ore is widening in direction of No. 2. No. 1 shaft is the deposit in the mine; it has been sunk three lifts in the past year, two of them 65 feet each and one 75 feet. They are now working mainly between the third and fourth levels in the direction of No. 2 shaft. The ore is from 16 feet to 30 feet wide. They are working out the ground in rooms, leaving pillars of ore, but between the fourth and fifth levels it is the intention to take out all the ore and support the ground with timbers, on the system that has been adopted in the Vulcan mines, having been inaugurated at the East Vulcan.

It is a very simple and complete arrangement, and is claimed to be the true Nevada system. At the bottom it commences with sills, into which the lower ends of the posts are dovetailed; the posts are 18 inches square and 7 feet in length. In the center of the top end is a tenon 6 inches square. The posts are set on the sills along the pillars and walls, and in rows between the pillars, at equal distances apart, caps are laid on the tops from post to post each way at right angles, the ends of the caps being separated from each other by the width of the tenon; these caps thus make a floor over the whole room, by being covered with logging, on which to stand to stope out the back to a sufficient hight for another similar set of timbers. The next set of posts have a tenon on each end, and are set directly over the first, the lower tenon fitting into the hole between the ends of the caps, and on the upper ends caps are laid as before, and a floor made for another rise. It will thus be seen that they are stayed equally well vertically and horizontally, and in all directions the timbers are in line. The length of the ore west of No. 1 to No. 2 is 160 feet. They have drifted east 70 feet, but find but little ore. The shaft in the 5th level is south of the ore, which is reached by a cross cut 40 feet in length. The shaft is down to the 6th level.

In No. 2 shaft they are mining in the 3d level near the shaft, where the ore has a width of 40 feet and a run of about 100 feet, not wholly free of rock, however. It will all be taken out coming up from below at the 6th level and the space timbered. The cross cut from the shaft to the ore at No. 2 in the 3d level is 130 feet long. The winze at the shaft is down to within 80 feet of being at the same depth as No. 1 shaft. They have drifted west at the bottom from No. 1 shaft beyond No. 2, and know that the ore west of No. 2 continues down so that they will have a body of ground to stope out from the 3d level to the 6th 100 feet in length and of a width of 10 feet and upwards that will give them a large amount of ore. This stretch of ore in No. 1 and 2 is the best part of the mines. The north mine is higher up on the hill, so that the 5th level in it corresponds to the 3d in the south deposit.

In No. 3 shaft in the 4th level they are mining a little ore in a small vein three feet wide, and are driving a tunnel in the 5th level east of the shaft into the foot wall—are in 30 feet. The shaft is now in rock.

At No. 4 shaft they are sinking to the 7th level, and are 400 feet below the collar of the shaft. They have sunk two lifts the past year. In the 6th level, in this shaft, they have drifted east 100 feet. The first 50 feet was in ore, but have since been in rock. The drift will be continued with the view to strike some ore 40 feet feet further on, that was passed through by the diamond drill, which showed 15 feet of ore. In sinking the shaft they have had 20 feet of ore, but now, at the bottom, there is considerable rock, they will cross cut to prove it. Above the 6th level the ore is worked out, and they are only stoping at the east end of the drift. Where the deposit has been worked in this shaft, it proved pockety, varying from 3 feet 40 feet in width. They think that they will find a good body of ore east of No. 4, basing the hope on the boring previously alluded to.

No. 5 shaft fell in from the top, but the lower levels were not disturbed. By stripping the top they have uncovered a large pillar of ore that had been left, and which is not now needed for a support, and is thus being mined out. It is fine ore, and will afford about 5,000 tons.

No. 6 shaft is the most westerly one. They are sinking it now below the 3d level, to get at a small vein of ore that is at the bottom. The ore preserves its excellent quality, a recent analysis of the average of the stock pile gave, metallic iron 59.5%; phosphorus .05%. But at the present market price of ore, there can hardly be much profit in mining it at the Vulcan.

The force employed at the west Vulcan is 350 men, 300 of whom are Austro-Italians, and the officers spoke highly of them as laborers, commending them as the most peaceable men they have ever employed, and showing an aptitude for mining work equal to that evinced by men of other nationalities. The Vulcan mines are among those belonging the Penn Iron Mining Company. The officers are Powell Stackhouse, President; Wm. S. Robinson, Secretary and Treasurer; Wm. R. Babcock, Ganeral Manager.

The work at the East Vulcan is in charge of Capt. John U. Curnow, and at the West Vulcan Capt. E. S. Roberts continues to direct the operations. Mr. A. C. Davis, the former agent, severed his connection with the company in May last. The Vulcan mines are the most easterly of the Monominee range mines that are now worked. The mines have yielded as follows:

Years.	Tons.	Years.	Tons.
1877	4,593	1880	72,405
1878	31,239	1881	85,671
1879	57,350	1882	94,042
Total gross tons			353,190

THE CURRY MINE

Lies just west from the West Vulcan a short distance. There is very little to record regarding it in addition to what was said in last year's report. They are working in the same lense of ore now as then, only that they have got so far west of the shaft and have sunk for another stope, that it was decided to sink another shaft to work the deposit. And they are now engaged in this work, sinking and rising at the same time. They have sunk and drifted in the ore to a sufficient extent to warrant the belief that they will at least get out ore enough to justify the sinking of the new shaft.

It is the property of the Curry Iron Company, the stock of which is now mainly held by J. H. Outhwaite, Esq., of Cleveland, Ohio. The mine was opened in 1879, and has since yielded as follows:

Years.	Tons.	Years.	Tons.
1879	13,010	1881	17,504
1880	21,741	1882	13,374
Total gross tons			65,659

The Curry is in the N. E. ¼, N. E. ¼, Sec. 9, T. 34, R. 29.

THE BRIAR HILL MINE

Adjoins the Curry on the west, being situated in the southeast quarter of the northwest quarter of section 9, T. 34, R. 29, and like the Curry it is in a single lense of ore pitching to the west. The mine has a single shaft, which is about 270 feet deep, and the ore has been followed down the foot wall that cuts under the lense to the west about 150 feet from the shaft. At the extremity they have a breast of ore 18 feet wide, 30 feet high, and they have drifted in west 30 feet. At the end they are sinking a winze for another stope and so far, in this winze, have not struck the rock which they entertained some apprehensions of doing. In these mines they can only be sure of what they see. These pockets of blue ore have shown a great liability to exhaustion, and it is a matter of uncertainty how soon the bottom may be reached. The Briar Hill Company are endeavoring to prove the ground a little further to the west and deeper, to find if this deposit holds out. They are boring with the diamond drill. If it is found that the ore holds out, it will be necessary to sink a shaft, as they have already about reached the limit at which they can work on account of the air.

It is the property of the Briar Hill Company, of Youngstown, Ohio, the same parties who own the mines at Crystal Falls, and at Iron River. H. C. Davidson, Supt. Product for 1882, 10,594 gross tons.

THE PERKINS MINE

Is a short distance west from the Briar Hill, and it has been a very productive and profitable mine; but as has been foreseen for a year or two past it is approaching the end of its career. This termination has been accelerated recently, since it is found that the limestone in the foot wall and the rock in the hanging, have come together in the bottom and to all appearances have cut out the ore entirely, so that all there is left to stope is what lies above the bottom level. While the formation dips to the south the ore deposits pitch down to the west, so that the ore in the east shafts—3, 4, and 5, has already been exhausted and they are only working No. 1 and No. 2 shafts adjacent to the Norway. Between these two shafts they have a body of ore standing, 100 feet long, 40 feet high and of an average width of 25 feet, and this deposit, with the same lateral dimensions, reaches 40 feet; east of No. 2 shaft, west from No. 1, to the Norway line, there is a run of ore 75 feet long and 30 feet wide, and 30 or 40 feet high. The bottoms of both shafts are in rock and the drifts, which extend from them have failed to reach any ore. At the east end of the mine they bored with a drill 350 feet, finding a succession of sandstone, jasper, limestone, etc., but no ore. A similar trial will be made in the west end of the mine.

On the 1st of May the company had 41,000 tons of ore at the mine in stock, and they are adding to it at the rate of 5,000 tons per month; are working 120 men; employed last year 200. The ore is used by the Cleveland Rolling Mill Co., who control the mine. There is some ore left in the pillars, which will be attacked when the ore in the bottom is exhausted.

Capt. John Perkins, now as heretofore, directs the operations at the mine. The mine began work in 1879, and has since afforded annually ore as follows, to wit:

Years.	Tons.	Years.	Tons.
1879	13,492	1881	60,706
1880	49,433	1882	73,648
Total gross tons,			197,279

The Perkins comprises the S. W. ¼ S. W. ¼ Sec. 4, T. 39 R. 29, and corners to the west with the Norway and the Stephenson mine and is thus within the limits of the village of Norway.

THE STEPHENSON MINE,

As is known, was worked down to the Perkins line. Some explorations have been conducted during the past year to the north of the limestone formation, which resulted in finding some ore but not in sufficient quantity to make a mine. It would seem to be well for the company to explore still further, as the indications are favorable for ore north of the limestone. The mine yielded 34,995 gross tons. All the ore was so completely removed that the mine has mainly fallen in, occasioning a sink from the surface, making a large hole and extending into the Perkins also. Cornering on these two mines and lying west from them is the

NORWAY MINE,

Which was formerly the largest producing mine on the "range," and with the exception of the Chapin still continues to be such. The Norway has been a valuable mine but it has probably passed the meridian of its prosperity, and possibly is already on the decline. At any rate the limestone in the foot-wall in the bottom in the east end of the mine next to the Perkins has assumed a nearly horizontal direction, and seems likely to cut out the ore as it has done in the Perkins mine. They have had very large pockets of ore in the Norway, as is shown now by the rooms which have been made by working it out, that have been cut out by jumps in the foot-wall. The foot-wall has suddenly flattened out in these places to the south, cutting out the ore entirely. Still the Norway is a good mine yet, and has a large amount of ore in sight, and will produce this year 125,000 tons. The mine was written up in considerable detail last year and also has been for the previous reports, and there is nothing found of interest beyond what has already been said heretofore.

There has been very little change during the past year, except as to the threatening position which it is found the limestone in the foot-wall assumes in the east end of the mine. In other respects and at all other parts the mine is looking as favorably as it was at this season one year ago. There are good stopes of ore in all the shafts, of which there are seven that are now operated, there being ten in all, numbered from the east to the west. The largest deposit of ore is found in No. 5, but it is a phosphorus ore, too high in phosphorus for Bessemer pig. The company, however, use it at their own works in Pennsylvania.

At the time of my visit to the mine, June 15, a serious fall of ground occurred in the east end of the mine, extending from the 3d level to the surface, where it made a depression of 50 feet deep and of an equal diameter. It was thought, however, that as it did not reach to the lower levels it would not greatly interfere with the mine. The Norway mine is very fortunate in the matter of its walls; they are in a remarkable degree self supporting. No mine on the "range," and indeed, very few in Marquette county, have such large chambers worked out and left without artificial support to the walls. There has thus been but very little timbering required in the mine, notwithstanding the immense deposits of ore that have been worked out, and there has also been but comparatively little ore left for pillars. The great stretches of roof stand without other support than the natural firmness and tenacity of the rock which composes it.

The Norway is the property of the Penn Iron Mining Company, until one year ago owned by the Menominee Mining Company. It is situated in the N. E. ¼, S. E. ¼ of Sec. 5, T. 39, R. 29. As formerly, the mining work is in charge of Capt. John Oliver, assisted by Capt. James Hoskins; W. R. Babcock, General Manager; Wm. S. Robinson, Secretary and Treasurer, Johnstown, Pa.

The mine was opened in 1877, and has since yielded as follows:

Years.	Tons.	Years.	Tons.
1878	7,533	1881	137,558
1879	73,590	1882	165,084
1880	198,165		
Total gross tons			581,930

The force now employed is about 500 men.

THE CYCLOPS

Mine adjoins the Norway on the west, and belongs to the same company. The mine has improved greatly in the last year, and from a mine that had the appearance of being exhausted, it has become a large producer of the finest of ore, and has an amount in sight that insures its existence for the ensuing year at least. The deposit that had just been discovered in the Curren pit, as described in the last report, has proved to be all that could be reasonably hoped for. They mined from it last year 18,287 tons, and now have a breast of ore above the bottom of the open pit, of 80 feet wide and 25 feet high, and into which they have drifted some distance, finding it to hold. It is calculated to yield a product the present year of 25,000 tons. The chief expense in obtaining it, is in stripping the heavy body of sandstone which overlies it. Capt. John Oliver, of the Norway, superintends also the Cyclops. The mine has yielded, since it was first opened, annually as follows:

Years.	Tons.	Years.	Tons.
1878	6,275	1881	12,214
1879	46,472	1882	18,287
1880	14,368		
Total gross tons			97,616

THE QUINNESEC MINE

Is also one of the mines purchased of the Menominee Mining Co., and now owned by the Penn Iron Mining Co. It is found within the beautiful little village of Quinnesec, and has been a valuable property. Unfortunately, however, the end of its career is, apparently, soon to be reached. There does not seem to be any more ore below the present bottom of the mine, at least none has been found, so that as it now stands when the present stopes are exhausted, they will have come to the end of the rope and the mine will be finished. The mine was very fully described in the last report and there is nothing to add.

The mine has yielded as follows:

Years.	Tons.	Years.	Tons.
1878	26,467	1881	43,606
1879	42,127	1882	44,240
1880	52,357		
Total gross tons			208,797

The officers are: W. R. Babcock, General Manager, Powell Stackhouse, President, W. S. Robinson, Secretary and Treasurer, Hon. Elisha Morcom, Superintendent.

THE INDIANA MINE

Is situated about three miles from Quinnesec. The mine affords a very fine grade of soft, blue ore, and the favorable developments which have been made during the year indicate that the owners may be fortunate enough to possess a valuable mine. The description is the N. E. ¼ Sec. 27, T. 40, R. 30 W. A branch of the C. & N. W. R. R. has been built to the mine, and over it shipments were made in 1882 to the amount of 4,280 tons.

The mine is now working under the direction of Mr. John Traverse, of the firm of Kruse & Traverse, Chicago.

The explorations which were going forward at this time last year at

THE ILLINOIS MINE,

Which adjoins the Indiana, resulted in nothing of value; no ore was found, nor has any good ore yet been discovered on the property. There is nothing doing at present on this location.

THE CHAPIN MINE (JUNE 16TH)

Affords the largest product of any mine on the "range," in fact it is perhaps the largest deposit of ore that is known in the State. From No. 10 shaft, the west end of the mine, to No. 8, a distance of 420 feet, the ore will average 90 feet in width; the maximum width is 128 feet. Thence east to No. 7 shaft its average width is 70 feet, and from this point on the width of the ore runs from 50 feet to 630 feet. It is a uniform soft, blue, specular ore, yielding about 64% in metallic iron, and low enough in phosphorus to be used for Bessemer pig iron. The entire season's out-put has been contracted.

The mine is wholly underground and reached from the surface by ten shafts, which are numbered from the east to the west. No. 1 shaft is only to the first level, and is of no value. No. 2 is a new shaft which was begun about a year ago but is now down to the third level. It is a mixed deposit of ore and rock, and will not probably reach settled ground until another level is attained. No. 3 is also to the third level, as far as it will be sunk, as it inclines toward No. 2 and the bottom is only 150 feet from it. No. 4 is only used as a timber shaft. All the other shafts are to the fifth level, which is the bottom of the mine, and they are rapidly being connected. The bottom level is graded down to the east one half foot to the hundred. The respective depths of the shafts below the collar of each are, No. 10, 371.16 feet, No. 7, 383.47 feet, No. 6, 388.7 feet, No. 5, 391 feet. The stoping now doing is all between the third and fourth levels, rising up from the fourth, in the rooms into which the ground is blocked out. Of these rooms there are 40 in number, each 20 feet wide and reaching from the main drift along the foot-wall across the deposit to the hanging. They are separated by pillars of ore 18 feet wide. These pillars are covered with lagging as fast as the rooms are made. In starting the rooms, as soon as the first under-cut is made to the hight for the first bent, sills are laid on the bottom eight feet apart across the room from pillar to pillar, on the ends of these are laid the stringers, which are pressed against the lagging of the pillars and held there by timbers that are laid between them on top of the sills on which the stringers themselves rest. The posts are set along the pillars over the ends of the sills and the lower ends dovetailed into the stringers; the upper ends are tennoned to receive the cap, which is morticed to correspond. Under the middle of each cap a post is set. Lagging placed over these caps makes a floor from which to take out the back of the room for another set of timbers identical with those below and set directly above them, and thus they continue to ascend in the room taking out the ore in successive stages until the bottom of the next level above is reached.

An important change has been made recently in handling the ore underground. Formerly it was allowed to fall on the bottom of the level, where it was shoveled into the tram cars. Recently, however, this has been changed, so that now the ore drops upon the floor over the bottom, and along one side against one of the pillars shutes are made from which the ore is drawn out into the cars. These shutes are along the main drift and in the rooms along one side. An ingenious arrangement for turning the cars from the main track into the rooms is made by having one short piece of loose rail—that is fastened at one end and moveable at the other. No frogs are necessary. There is a good deal of sameness in the mine; the working level is made up of a succession of rooms, the one precisely like the others. The lower level has not been touched, beyond sinking the shafts and driving the connecting tunnels. It is 80 feet deep at No. 10, and increases to the east, becoming 100 feet at No. 5, so that there is all this immense body of ore to be taken, while the 4th level still has enough ore for the year's product. No. 7 shaft has a double skip hoist, all the rest are single skip shafts. The daily product is 1,000 to 1,200 tons.

They had a "cave" in the mine last fall, occasioned by the foot wall sliding, but no serious damage was done.

The ore is run out on long elevated tramways extending from the shafts to the ore docks. These tramways are worked automatically as at the copper mines, and they extend from Nos. 5, 6, 7, 9, and 10 shafts; No. 5 tramway is 800 feet long and takes also the ore from No. 3. They terminate at the railroad in ore pockets, which take all the ore in the shipping season. Some of the ore docks are on a level with the railroad, and to load the cars from these the ore has to be run up an incline of a hight equal to the hight of the car. To do this they operate a small hoisting plant, set on the dock, and by means of it the loaded tram cars are run up the incline. The timbers are prepared at the company's mill down by the railroad, and are drawn up to the mine on the long incline, on cars attached to a wire rope.

During the past year a fine large pumping engine and boiler house has been built at the upper end of the mine; the walls are of red sandstone and it has a substantial look. The new pumping engine is a duplex with cylinders 24 inches by 48 inches, with balance wheel 20 feet in diameter. It works a 12-inch suction pump that takes the water from 1, 2, 3, and 5 shafts and probably will take all the water in the mine when another level is opened.

The shaft in the swamp next to the Ludington was abandoned; they found too much water and quick sand to get it down. No doubt but the ore extends through this ground that has not been opened.

The mine has shipped as follows:

Years.	Tons.	Years.	Tons.
1880	34,556	1882	247,505
1881	134,717		
Total number of gross tons			416,878

It is probable that the present year the mine will send out more ore than any other mine will ship, in the State. The mine is worked on a lease by the Menominee Mining Company.

On the 1st of May last Mr. C. H. Cady, formerly an officer at the Cleveland, and more recently agent of the Detroit Mining Co., assumed the agency of the Chapin. Capt. C. B. Rundle remains Superintendent, W. M. Oliver, Mining Captain, Per. Larsson, Mining Engineer.

The water-works which, as stated in the last report, the company contemplated constructing at the upper Quinnesec falls, on the Menominee river, have been building during the past year, and probably by another season will be in readiness to go into operation. The purpose is to furnish all the power for this and other mines in this vicinity, that shall be required for pumping, hoisting, and working power drills, with compressed air. The water power will be used to compress the air, and it will be conveyed to the mines in pipes as is now done at the Republic.

THE HEWITT MINE,

Which was opened in the Chapin vein on the south side of the latter and worked down against the Chapin line and thus exhausted, found a new lense of ore by cross cut from the old mine, 350 feet south.

During the last year the company has sunk a shaft in the south deposit, 180 feet deep. In the bottom they have drifted east 140 feet and 50 feet to the west from the shaft. The drift is partly in ore and partly in rock, a mixed deposit. Eight hundred feet to the east is another shaft which is sinking, and is down 130 feet, and in this some ore is found. From the two about 30 tons per day are obtained.

The company has a diamond drill at work away to the west near the railroad, and here they bored through 27 feet of ore. The Iron Mountain Mining Company's property joins this on the west, and as the boring is near the line the owners of the latter are considerably elated over the discovery.

The Hewitt mine has yielded as follows:

Year.	Tons.	Year.	Tons.
1881	4,352	1882	9,667
Total gross tons			14,019

H. Tucker, Esq., Superintendent; W. P. Bice, Mining Captain.

The ore is of the same quality as the Chapin.

THE LUDINGTON MINE

Joins the Chapin mine on the west, being situated on the rising ground on the opposite side of the valley which separates them, and, while it does not rival its neighbor in magnitude, it is still a mine of considerable proportions. The mine is in the western continuation of the same ore deposit, and the ore is the same. Although the mine has been worked but a year, the promise given by the early openings have been borne out in the subsequent developments. The trend of the ore is east and west, and the dip is to the north, at a very steep angle, in fact in the open pit it apparently goes vertically down, but in the underground workings it is said to underlay slightly to the west, as it naturally would do. The mine is about 800 feet long, and has three shafts, two of which only are worked.

No 1, the western shaft, is in a mixed, narrow deposit of ore, and is not pushed. Between the other two is an open pit, worked down to a depth of 80 feet, and in length 175 feet. In this pit they are mining in several stopes, hoisting with derricks and buckets.

The east shaft is down to a depth of 240 feet, to the 3d level, and on its way to the 4th. They have cross cutted the ore in the 3d level and find it to be 90 feet wide. North of the open pit they are sinking a vertical shaft, which ultimately will be continued down to the ore, but for the present will go only to the 3d level, when they will drift south to the ore, to connect with the workings under the open pit. This shaft is all in rock. No. 2 shaft is down to the 2d level. There is a bar of jasper extending longitudinally through the ore, separating the lense. The underground chambers are timbered after the Nevada system. They are mining 400 tons per day, and the gross product has all been contracted. The mine is changing so rapidly that it is scarcely worth while to enter into a detailed description of the underground workings. It suffices that they have ore in sight to afford a product the present season of from 75,000 to 100,000 tons, and there is every indication of its continuing, affording a first class mine, producing first class ore, for which there is sure to be always a market. A branch of the C. & N. W. R. R. comes to the mine in convenient shape for shipping, and the company has at the mine the usual facilities for handling, etc., with a reasonable degree of ease and economy. Between the two mines, the Chapin and Ludington, and a little to the south, lies the pleasant and thriving village of Iron Mountain. Mr. Stockbridge, the agent of the Ludington, has built, on the hillside overlooking the town, an elegant residence, which, although pleasantly surrounded by foliage, is plainly visible from the village. The present mine was opened one year ago, and, as stated in the last report, the old mine of the company was abandoned.

The company began shipment in 1880, and has sent off as follows:

Years.	Tons.	Years.	Tons.
1880	8,876	1882	52,519
1881	3,365		
Total gross tons			64,760

Mr. Geo. E. Stockbridge gives his personal attention to the management of the mine, and it was through his presistent effort that the discovery of the ore was made. William Bice remains mining captain.

THE KEEL RIDGE MINE

Was the scene of a terrible tragedy, in the month of April last, whereby eight men lost their lives, and their bodies still lie buried in the mine.

It was well known that the mine was exhausted, and the only mining work recently done in it has been the taking out of the pillars, etc., preparatory to abandoning the mine. It began to be noticed that the ground was settling and cracking, and giving warning of coming down, and the superintendent gave orders to do no more mining or hoisting of ore, but to take out the pumps and machinery and leave it to fill up. This work of removal of the property had been accomplished, and the men were all on the surface. A number of them standing near the shaft when they felt the ground giving way, and thinking that the shaft was about to collapse ran from it, and were standing over the mine in a place of supposed safety; only one of the men, Thompson, thinking possibly the fall might run to the surface, ran from the spot where they were standing and barely escaped going down with the rest. They were buried 200 feet below the surface.

It was not expected that when the fall should occur it would extend to the surface. It was supposed that the arch of rock standing above the bottom levels would hold up the surface, and the fall would only be below this. But the foot-wall had been cut away under, and it is probable that the pressure caused the sliding of the rock on the foot wall, when of course the arch broke away and let in the whole mine from the surface. An attempt was made to resecue the bodies of the men, but it was found to be impossible. It was only by chance that eight more men did not lose their lives, and the work was abandoned. The buildings, machinery, etc., will be removed from the mine.

The company is now exploring adjacent to the Chapin and Ludington, preparing to sink a shaft, with a diamond drill. They bored here last year 530 feet deep, and lost the drill. The purpose was to find the Ludington deposit and sink to it.

The Keel Ridge mine has yielded as follows:

Years.	Tons.	Years.	Tons.
1880	11,445	1882	23,171
1881	19,011		
Total gross tons			53,647

Mr. J. T. Jones superintends the work now as formerly.

The company is known as the Emmet Mining Company.

THE FELCH MOUNTAIN RANGE (JUNE, 1883)

Has a length of perhaps 18 miles, extending from the east branch of the Sturgeon river in township 42 N., R. 27 W., to the Menominee river in township 42 N., R. 31 W. But in all this distance, while the occurrence of ore has been frequently observed and at several points a good deal of money has been expended in exploring, it is very doubtful if there has yet been found in this range a mine that has any permanent value. There are deposits of ore of an excellent quality as at the Metropolitan and the Northwestern mines, but they have proved to be of very limited extent. At the present time the outlook for the Felch Mountain district is a very dubious one. I regard it as the most unpromising mining field in the iron region.

The Chicago & Northwestern Railway Company has built a branch, connecting with the main line at Naretta, which is 28 miles in length, and reaches the Metropolitan, Northwestern, and Calumet mines. It looks very doubtful if these mines are likely to furnish ore enough for shipment to compensate the company for the cost of this road.

The ore shows well on the surface, but at no point has it been found to hold in depth. The deposits are shallow basins of ore, or short surface lenses that soon work out. In some instances, as at the Northwestern, "the show" is a mere wash or veneering of ore over the rock. At this mine the owners uncovered what appeared, at a mere surface view, to be a very large deposit of fine, soft blue ore. Men journeyed 30 miles through the woods over the rough road that connected the mine with the railroad to see it. Its fame spread far and wide, and the Northwestern was boomed up as one of the most extraordinary deposits that the country afforded, which indeed it was, but in a sense quite the opposite of that which was held. The stock was sold as high as $22 per share, the par value being $25, and the number of shares 20,000.

The owners may have purposely avoided to sink in this apparently promising deposit. Certain it is that a very limited investigation proved it to be valueless. It was simply a thin wash of ore lying upon the rock. If all of it were scraped up and saved there would not be ore enough to make a car load.

At a distance of several hundred feet from the "elephant," as this humbug of a deposit was called, the company are now working. They have a long, open cut about 15 feet wide in a poor quality of yellow hematite ore. Extending from this west is a drift 70 feet long, that is now in fine blue ore. They are preparing to develop this new find, and entertain the expectation that it will prove valuable. They are doing a limited amount of exploring at another point a short distance away south of the jasper, but as yet have met with not particular success.

THE METROPOLITAN MINE

Is east of the Northwestern, on the top of the jasper bluff which extends east and west and slopes to the south. The foot of the bluff is diorite that extends for a considerable distance south. The main mine is in the jasper; they have two shafts, one of them sunk in the bottom of an open pit below which it reaches a hundred feet. The other is 250 feet to the east and is 130 feet deep. Between these shafts is a stope of very good hematite ore, 10 to 15 feet wide and 20 to 50 feet deep, and narrowing to a mere seam at the bottom; between the shafts to the depth mentioned the whole bottom is rock and the drift is headed with rock at both ends. At the east shaft, however, they have a lateral deposit extending south across the formation, in which they are stoping and have not reached the end. They are also sinking the shaft for another level in this deposit It has a width of about 20 feet.

The company has a stock pile mined from the open pit which is about three-fourths rock and one-fourth ore. This they are sorting, and shipping the ore.

Further to the west and north is a long, open, canoe-shaped pit, in red ore. The walls dip towards each other and tend to cut out the ore—limestone on the west and jasper on the south. The ore is of poor quality, and they are not now working in this pit.

Southwest from the Northwestern, a short distance, the Metropolitan has another somewhat extensive opening. The product is mainly a soft, yellow ocherous ore, spread out over the limestone bottom and filling innumerable cavities in this rock. Found with this ocher in limited quantity, is some of the blue ore, and also in still less supply, some exceedingly fine, hard, bluish hematite ore. They were doing some mining at this point at the time of my visit, mainly to pick out the small pockets of blue ore. They have also accumulated a stock pile of the yellow ore of several hundred tons.

The company has done some exploring at other points, at one of which, adjoining the Calumet mine, it is proposed to prosecute work still further. The company holds leases of 520 acres. The mine is in the N. E. ¼ Sec. 32, T. 42, R. 28. S. P. Burt, President, R. C. Hanna, Secretary and Treasurer, Jefferson Day, Superintendent.

Twenty-three thousand eight hundred and fifty-four tons of ore were shipped from the mine in the fall of 1882. At the main mine is a good engine house containing four Rochester drums, etc.

THE CALUMET MINE (JUNE, 1883)

Is by far the most promising of the mines in the Felch Mountain district. It is about three miles south from the Metropolitan, the description being the S. W. ¼, N. E. ¼ and the S. E. ¼, N. W. ¼ of Sec. 8, T. 41, R. 28. The mine is in about the center of the property. Between it and the Metropolitan are a succession of granite ranges, separated by marble, diorite, and schist. At the Calumet the formation seems to be more regular than it is at Felch Mountain; but still there is the same pockety character in the ore deposits; they show the same tendency to become quickly exhausted. The ore is of excellent quality, soft, blue ore; analyses range from 60.42% to 69.16% in metallic iron, and in silica from .54% to 9.15%, in phosphorus .014 to .038%.

"The new find," which has been recently opened, is certainly a very fine show of ore, and if it shall fortunately continue will make a valuable mine. This new opening is about 600 feet in length and 30 feet in width, though the length of the deposit has been proved for 800 feet and for a maximum width of 67 feet. The ore is covered with a depth of about 15 feet of earth with which it is in contact. It is very easily and cheaply mined, but it is a matter of uncertainty to what depth it may extend. One hundred feet west from the open pit a drill hole was made, dipping 45° to the north across the formation. The length of the hole was 372 feet, and it cut the ore at a depth, as Captain Wood states, of 150 feet below the surface. He also says that a drift, south from the old mine, 150 feet below the surface cuts this ore, but that they did not cross it. However, at the time of my visit but a small amount of mining had been done in this deposit, and there was nothing to indicate to what depth it might extend; but if it holds down it will prove an exception to all the other deposits that have been opened in this district. The old mine, a short distance to the north of the new deposit, has been quite extensively opened, and formerly the prospect was a very encouraging one for a large and valuable mine, but the ore does not seem to hold.

They are mining and shipping about 25 cars of ore per day (June 15th), though 50 cars could be loaded as readily, and as soon as the cars and vessels can be had the amount of ore shipped daily from the mine will be double the present output. The railroad track comes in between the mines, and the engine house is north of the mine. The location is really a very pleasant one, and the miners' houses, etc., scattered among the trees make up a very neat, cosy little village.

Adjoining the east end of the property on the S. E. ¼ of the N. E. ¼ of Sec. 8 the Metropolitan has done some exploring with the diamond drill. The cores are mainly quartzose schist. On the line the two companies joined in sinking a shaft, which was put down to a depth of 70 feet. The refuse indicates that they sunk in mainly mixed ore and jasper. This jasper belt is overlaid with the quartzose schist.

Work was begun at this mine in 1881. The railroad was completed to the mine in the fall of 1882, and up to the close of navigation 5,847 tons of ore were shipped.

A. B. Cornell, President; Robert McCurdy, Treasurer; John R. Wood, Superintendent.

THE HECLA MINE

Is a location by the side of the railroad track, northwest from the Calumet, that, so far as has been shown, has no value. A wash of blue ore was found along the trough of a small ravine, but not enough of it to pay to mine. Several borings with the diamond drill made across the formation one rod south of this deposit of ore, failed to discover any continuance of it. Exploring work has been abandoned.

THE BRIAR HILL COAL COMPANY,

Of Youngstown, Ohio, has been exploring on several options in the vicinity of the Metropolitan and Northwestern mines, with a diamond drill, but becoming disgusted, has just concluded to abandon this work, and ship away their machinery. A hole bored at the south, at an angle of 45°, across the formation, between the South Metropolitan and the Northwestern, south of the jasper, on sec. 32, T. 42, R. 28, passed through 50 feet of lean ore, thence 200 feet of marble, when 34 feet in thickness of poor quality of ore was found, thence 50 feet of chloritic schist, succeeded by 40 feet of quartzose schist. A second hole produced a like unfavorable result.

THE FELCH MOUNTAIN MINING COMPANY,

Which is really the Menominee mining company, has done a large amount of exploring work in this district, without succeeding in finding any valuable deposits of ore. They are now at work on Sec. 31, T. 42, R. 29, west from the Metropolitan, where they have done a good deal of work, finding just enough ore to encourage them to keep on, but not enough to make a mine. They are running two drills, one at this point, and one west from the Calumet mine. Mr. Gould, who superintends the work, expresses a poor opinion of the country. The company has expended the sum of $100,000 in this exploring work.

THE CRYSTAL FALLS IRON COMPANY

Has recently stopped work entirely, discharging all their men. The shaft at the Falls was abandoned in the fall of 1882, and later or early in the present year the Fairbanks mine was also abandoned, the company removing all the machinery to another point on the property adjoining the Great Western mine on the west. Here they sunk two shafts, each to a depth of 50 feet, and have done a good deal of drifting, hoping to find the continuation of the Great Western deposit, but without success, and recently, in June, the work was discontinued.

The Fairbanks mine shipped last year 8,121 tons of ore. James H. Elmore, Superintendent, Crystal Falls, Mich. The Fairbanks mine is in the S. W. ¼ Sec. 21, T. 43, R. 32.

The Crystal Falls mine, owned by the same company, shipped 1,341 tons of ore. The location is Lot 3, Sec. 20, T. 43, R. 32.

THE PAINT RIVER MINE

Adjoining the Fairbanks mine on the west, in the S. E. ¼ of Sec. 20, T. 43, R. 32, is looking fairly well. The mine has been opened underground with three shafts, No. 1 of which is near the Fairbanks line, and is down to the second level, a depth of 70 feet from the surface, and is reached by cross-cuts to the south; the ore has been mined out above the 2d level to the west of the shaft, to half the distance to No. 2.

No. 2 shaft, 120 feet west of No. 1, is 150 feet deep, inclining slightly to the south. The shaft has been sunk regularly with side pillars and winzes to the 4th level, and in each of the levels—2d, 3d, and 4th, they have drifted west 50 feet, and in the 3d the ore has been mined down to a hight of 20 feet and left lying in the mine, ready to hoist, when it can be sold and shipped.

No. 3 shaft is a new undertaking, 300 feet further to the west, and is only down to a depth of 24 feet; the bottom is in mixed ore and rock. The company is working about 18 men and has not sold any ore. Some samples of the ore recently taken from No. 2 shaft, gave an analysis 63% in metallic iron, .95% in silica, and .46% in phosphorus. The width of the ore in No. 2 shaft is about 20 feet and is tolerably free of rock. It is dark brown hematite, containing also a percentage of lime and manganese.

The mine is provided with hoisting machinery, etc., and is in shape to take out considerable ore whenever there is market for it. Joseph Austrian, Secretary and Treasurer; C. T. Roberts, Superintendent, Crystal Falls, Michigan.

THE GREAT WESTERN MINE

Is claimed, by those interested in it, to be the leading mine in the Crystal Falls district. It has certainly developed into a far better mine than was anticipated by those who examined it when it was first opened years ago. It lies east of the Fairbanks, in Sec. 21, T. 43, R. 32. The mine is in a cedar swamp, and there are three shafts now working, with a fourth one just begun. No. 1 is near the west line, and is sunk to a depth of 100 feet from the surface. In the bottom, it is claimed that the ore deposit has a width of 30 feet, dipping slightly to the south. No. 2 shaft, 280 feet to the west, is sunk to a depth of 50 feet, and is connected by a drift with No. 1. No. 3, two hundred and eighty feet west from No. 2, is also 60 feet deep, and is the best part of the mine. They are extending a drift from the bottom west, to meet one driving east from No. 2, and the length of the two is about 240 feet, only wanting 40 feet to connect. The ore deposit in No. 3 shaft is 45 feet wide, 13 feet of which along the north side is claimed to be Bessemer ore, since an analysis of it gave .045% phosphorus. They propose to mine the ore in rooms 20 feet wide, leaving pillars, and timbering between, after the Nevada system.

They are mining and shipping from these three shafts, daily (July 10th), about 25 car loads, sending it to the Florence furnace. It is said to work well. No 4 shaft is located still further to the east. Several attempts have been made to sink this shaft, but failed through inability to get through the water and quicksand. The present undertaking has been begun by inclosing the timbers in a caisson of ⅛ inch sheet iron, intending to push it down outside the timbers, adding to it from the top, and digging away under. The distance to the ledge is 35 feet. Opposite No. 4 shaft, to the south a short distance, a new engine house has been built, and in it will be placed the machinery for operating No. 3 and No. 4 shafts, and others which may be made still further to the east. They employ at the present time a force of 120 men, many of them carpenters, etc. A branch from the C. & N. W. Railroad extends to the mine. Secretary, S. D. Hollister; Superintendent and Treasurer, George Runkle.

THE ACME MINING COMPANY

Is a new organization which has recently begun to explore in the S. E. corner of the N. E. ¼ of Sec. 20, T. 43, R. 32, in what is thought to be the westerly extension of the Great Western deposits. The point of present operations is just north of the railroad track, where they have a few men engaged sinking test pits, employing a small engine and boiler to pump the water from the pits. At the time of my visit (July 11th) they were sinking in the ledge at a depth of 15 feet from the surface. The ledge being a mixture of slaty jasper and ore, it was proposed to keep sinking, hoping to reach ore. The work is conducted under the direction of S. D. Hollister, Superintendent.

ON SECTION 14, T. 43, R. 32,

Some parties are exploring and have found a deposit of very good ore, which is said to analyse well in iron, and sufficiently low in phosphorus for Bessemer pig.

ON SECTION 29, T. 43, R. 32,

Mr. S. D. Hollister has some men at work, and has done quite a little exploring, but has not found any good ore.

THE UNION MINE,

Formerly known as the Sheldon & Schaffer mine, but now held on a lease by the Chicago Union Iron and Steel Company, has been idle for some months, or since the failure of that company last winter. The mine consists of an open pit about 200 feet long, 80 feet deep, and 12 feet in width. Stulls have been placed from foot to hanging to support the walls, and by covering with lagging to protect the men when working in the bottom. The ore is of very good quality, being somewhat lower in phosphorus than most of the ores found in the Crystal Falls district, but is badly mixed with rock, and requires a great deal of sorting.

Some legal contention exists between the owners of the fee and the leasees. The property comprises 320 acres, being the N. W. ¼ of Sec. 31 and S. W. ¼ of Sec. 30, T. 43, R. 32.

Geo. Lyon, Agent, Crystal Falls, Mich.

THE YOUNGSTOWN MINE

Is located in a cedar swamp that extends east and west between two ranges of moderately high bluffs that rise to the south and to the west. Running east along the north margin of the swamp, is Bertha creek, which a little further on flows into the Paint river. Along the south side of the swamp is the mine, extending entirely across the N. E. ¼ of the S. E. ¼ of Sec. 19, T. 43, R. 32, and east into Sec. 20, where recently the largest body of the ore has been found giving the mine a length, thus far opened, of upwards of 1,400 feet. So far th ore that has been mined has been mainly taken from No. 2 shaft and from th open pit to the east of it. The shaft is about 100 feet in depth and the pi about 70 feet, and are situated west of the center of the forty. The ore is hoisted with derrick in baskets to the top of the high trestles which reach from the shafts to the ore dock that has been built along the foot of the south bluff on the south side of the railroad track. Eight thousand tons were mined during the winter before the mine shut down, and 6,000 tons still remain on the dock (July 10).

East of the open pit, about 120 feet, it was ascertained that there were two lenses of ore separated by rock, and it was decided to sink a main working shaft in the rock and reach the ore deposits by cross-cuts to the north and to the south, the former of which has a width of 40 feet, and the latter of 15 feet. This shaft was sunk during the winter, and at the time that work was suspended had reached a depth of 100 feet. It is vertical, well lined up and strongly made, 12 feet by 16 feet inside the timbers. It is calculated for two skip tracks, ladder-way and pump pipe. It will be the main working shaft for the central part of the mine.

But the chief discovery has been made at the Nelson shaft, just east of the section line in Sec. 20. This shaft was sunk not without much difficulty, owing to the influx of water and quicksand, during the past winter, and is now found to be at a depth of 66 feet, in a large body of ore; how great has not yet been determined, but at 60 feet from the surface they have drifted north 90 feet from the center of the shaft, and south 52 feet, all in clean ore, and neither way has any rock been found. The ore is very uniform in appearance, a dark brown hematite of medium hardness, averaging about 60% in metallic iron, .30% in silica, but too high in phosphorus for Bessemer pig.

The Youngstown ore contains an amount of alumina, magnesia, and lime in quantity that should render it suitable for working easily in the furnace, without additional flux.

The Nelson shaft, so called, was sunk as an exploring shaft, and is too small to be used for extensive hoisting. A large working shaft has been started to the east, and the sinking of this shaft is the only mining work now carried on at the mine. A large engine house has been built near the west end of the mine, furnished with four hoisting drums—Merritt's pattern—and two large boilers, etc. Other necessary buildings have also been erected and upon the top of the bluff, to the south, a large, commodious boarding house and about 20 good frame dwelling houses have been built during the past year.

The officers are: John Stambaugh, President, Youngstown, Ohio, J. G. Butler, General Manager, F. P. Mills, Agent and Superintendent.

THE QUINCY MINE

Is simply the result of a protracted effort, still continued, to discover ore just west of the west line of the Youngstown mine. The ground is very wet and there is a great depth of overlying drift, but the ledge has been reached in two places at a depth of about 40 feet, and some ore has been obtained mixed with rock. The ore found in the shaft that they are now engaged in sinking is, apparently, of excellent quality, a very hard, fine grained hematite, closely resembling hard specular ore. The work is delayed by reason of a fire that burned up their engine house (July 10). The location is the N. E. ¼, S. E. ¼ Sec. 19, T. 43, R. 32.

THE CHICAGON LAKE MINE

Is about six miles east from Iron River, in the W. ½ of the N. E. ¼ of section

26, T. 43 N, R. 34 W. A small force of men, under the direction of Capt. Henry Roberts, is working at the present time at this location. They have taken from a small open pit about 2,000 tons of ore, which is held in stock awaiting the advent of the railroad to this point. The ledge has been stripped for a length of a hundred feet. The ore deposit has a width of from 15 to 40 feet, is a brownish colored hematite averaging 58% in metallic iron.

The mine has a plant for hoisting and pumping.

THE DELPHIC MINE

Is situated in the N. E. ¼ of the S. W. ¼ of Sec. 24, T. 42, R. 33. Considerable mining work has been done in advance of the building of the railroad to the mine. The branch to this location will be about a mile in length, extending from the Mastodon line, which latter connects with the Crystal Falls extension of the C. & N. W. R. R. At the Delphic they have sunk a shaft 50 feet deep, 30 feet of which is in ore, and at the bottom they have cross-cutted in fifty feet of ore. The ore is similar to that found in the mines in this vicinity. Some of it was smelted in the Florence furnace with, it is said, good results. At other points in the line of the ore test pits have been sunk to the ore, and some drifting across it done, so that for a distance of several hundred feet in length they have proved the ground to a sufficient extent to afford the assurance that the ore exists in quantity for a large mine if they can find market for the ore.

The work is in charge of Capt. J. E. Western; Geo. W. Smith, President; John J. Cahill, Secretary; W. A. Whittlesey, Superintendent.

THE ALPHA MINE

Is situated in the S. W. ¼ of Sec. 12, T. 42 N., R. 33 W., in Marquette county. The mining work done comprises a shaft sunk to a depth of 80 feet. A small amount of drifting which has been done has developed a deposit of ore 16 feet in width, according to the authority of Capt. Schwartz, who has charge of the work.

THE MASTODON MINE

Continues to work, employing a force of about 25 men and they have about 5,000 tons of ore in stock, the shipment of which has just begun. The branch railroad to the mine was completed last fall in time to enable the company to ship 3,477 tons.

The results of the year's work, though not very extensive, have shown very favorably for the mine and seem to place it on an assured basis. Both open cut and underground mining have been adopted, the ore showing a width of 10 to 20 feet. The company has a small engine and boiler and two derricks, the latter worked with horse. The ore is apparently a good quality of hard hematite and is said not to be excelled by any found in the Crystal Falls district to which this mine belongs.

The officers are Edward Breitung, President; Joseph Austrian, Secretary and Treasurer; J. F. Simmons, Supt.

THE MANHATTAN MINE,

Situated near the Mastodon, has been abandoned and the company is removing the machinery.

IRON RIVER DISTRICT.

But brief mention was made of this locality in the last report, as at the time of the writing the railroad had not been completed, and scarcely enough mining work had been done to enable one to determine how extensive the ore deposit was. Within the year that has since elapsed, however, the railroad connecting the mines with the Menominee branch of the C. & N. W. railroad, has been completed, and the work of mining and shipping ore has since been carried forward with as much vigor as circumstances would allow, resulting in the development of two, apparently, among the most extensive and valuable of the iron deposits that have been lately discovered. Of these

THE IRON RIVER MINE

Is one of the most interesting and, probably, one of the most valuable of the new mines that have been recently opened in the upper peninsula. The location is a very pleasant one, and very advantageously situated for rapid development of mining work. Until recently the Iron River district has been an inaccessible region, to be reached only by a journey of thirty miles on foot or by vehicle over a most execrable road from Florence; but now since the completion of the railroad connecting with the Crystal Falls extension of the Menominee branch of the Chicago and Northwestern railroad, the arrangement of trains is such that one may leave the Marquette district on the Chicago express train and arrive in Stambaugh the same evening. Back from the river, where the mines are situated, the country is sufficiently level and heavily covered with fine hardwood forests. Outcrops of rock are rarely seen, the surface being everywhere deeply covered with a strong, loamy soil, excellently well adapted to yield in abundance such products as the climate of the country will admit to be cultivated. There are two villages which have started on their career, each with the determination to outdo the other. Stambaugh, situated high upon the bluff to the east, looks down upon its rival, Iron River, built in the valley, scarcely half a mile away, upon the opposite side of the river. But it cannot be claimed with any degree of truth that the denizens of the newly-created hamlet in the valley of the sparkling river look upward with blessings upon the equally self-esteemed fortunate dwellers of the hill. The upward glance to their rival, if not accompanied with animadversions, must at least be only taken in a physical sense, and has in no wise a social or a moral application. Apparently, however, Iron River has the advantage; the village is the most accessible by railroad, and it has a large hotel, an institution yet wanting in Stambaugh, but one which steps are being taken to speedily remedy. Besides, Iron River will be at the intersection of two railroads, since the Ontonagon and Brulé River road has surveyed its line through that town and located its depot there. It is said that the contracts are already let for completing the road to the State line the present season, and that the Wisconsin and Northern, with which it is to be consolidated, is rapidly advancing to meet it. So that in the not distant future there will be a continuous line of railroad from Ontonagon harbor to Milwaukee. Stambaugh has the advantage, probably, in the matter of mosquitoes ; its elevation should tend to lessen its suffering in this respect, and also it is greatly the superior in fine residences. The elegant dwelling of Mr. Porter, the superintendent, would be an ornament anywhere, and Dr. Carpenter has the pleasure of watching the building of the commodious, tasteful dwelling which he is constructing at Stambaugh and happily anticipating the rapidly accruing time when he may remove his family from Ishpeming, and, relinquishing the bachelor miseries which he is now enduring, again gather together his household gods beneath this newly made roof tree. It may be pleasant to the many friends of the doctor to know that he is greatly esteemed at his new location. The people congratulate themselves on their good fortune in possessing in their midst so reputable a physician, who is so kind-hearted and high minded a gentleman. It is unfortunate that the name of the village and mine were not the same. It will be observed that Stambaugh was laid out by the Iron River company, while the village of Iron River is in the vicinity of the Nanaimo mine. It is at the Iron River mine that the greatest activity prevails, and this company holds the most promising deposits of ore, and has thus far made the greatest advance in opening its mines. The natural situation of the ground is such as to enable the company to open its mine and locate its ore docks and railroad tracks, etc., so as to secure the greatest facility and economy in the work of mining and handling the ore.

The company holds the west half of the west half of Sec. 36 and the east half of the east half of the N. E. ¼ and the N. E. ¼ of the S. E. ¼ of Sec. 35, all in town 43 N., range 35 W. The line dividing the two sections runs along the west slope of the hill that extends down to the margin of the Iron River and rises to a height of 50 feet to 100 feet above it. The north section corner is situated in the west bank of the stream, and the corner on the south end of the line is also on the west side about a hundred feet distant from the river. Between these points the river has a general north and south direction west of the section line and distant from it from 50 to 300 feet. It is along this hill-side, and near the section line, that the ore has been discovered, the chief deposits, as far as is known, being on section 36, and near the north and south ends of the sections. Where they are now mining is midway between the quarter post and the section corner, in the north half of the section and just east of the section line. The forties are owned by different parties and are held on leases by this company which run 20 years, and for which the consideration is a certain sum per ton royalty to be paid for the ore mined. The ore has been stripped for a length of about 800 feet, and shows a width of clean ore of from 30 to 80 feet. The railroad track has been built between the river and the mine with a down grade, so that the cars left standing on the track to the north are run down as required, by the force of gravity, to the dock, and when filled with ore are, in the same manner, allowed to run down to the south to be hauled away, each morning, by the locomotives to Escanaba. The ore dock is so near the mine that it is but a brief run of 50 to 100 feet, with the tram cars and horse carts to convey the ore from the stopes to the cars. In this manner, at this point, they are now mining and loading, each day shift, 75 to 100 cars with ore, with a force of about 100 men. There is no machinery of any kind on the ground—no engine, no boiler, not even a derrick nor bucket. In lieu of a steam whistle the men are called to their work and notified when to leave off by the musical vibrations of a triangle hanging in front of the office. No mining could be simpler or more intelligently planned; all the advantage due to the conformation of the ground and the situation of the ore has been taken, and it is probable that at no mine in the peninsula is the ore at the present time obtained at so small a cost per ton. Of course there has been considerable preliminary expenditure preparatory to mining, simply as it is now done; and by and by when it becomes necessary to sink below the level of the dock, to a depth greater than will admit of hauling out with horse carts or tram cars, the introduction of machinery will be in order and thus a further expenditure must be inevitably incurred when the time comes for meeting the same conditions that prevail in other mines, and the work must be proceeded with in the same manner here as elsewhere. But for the present season, to furnish a production of 100,000 tons, no machinery will be necessary. The ore at this mine is a moderately soft, brown hematite, of a rich umber color, yielding an average of 60 per cent and upwards in metallic iron, and about .175 in phosphorus.

At the southwest part of the section, in the southwest quarter of the southwest quarter of Sec. 36, the company has partially developed another, apparently, very large deposit of ore; both at this point and where they are working the ore slightly outcropped, and the fact is found noted in the U. S. survey. At this south mine the conformation of the ground will admit of the same arrangements being made for opening the mine and handling the ore as are adopted at the mine now working. A side-track has been surveyed from the main line along the foot of the hill in front of the mine, giving a grade of one foot in a hundred. A dock will be built along the side of this track, and the earth removed from the ledge, leaving the elevation of the outcrop of the ore above the level of the dock a sufficient degree to afford the opportunity for mining out a large amount of ore before the use of machinery will have to be resorted to. A drift commencing in the side hill at the end of an open cut extends east diagonally across the ore 150 feet to the foot wall, the graphite as it is called—a black, slaty rock, easily fractured, and disintegrating on long exposure to the atmosphere. Test pits and trenches have been made, showing the ore for a distance of 1,000 feet along the line of the formation. South of the section line, on Sec. 1, some test pits have been made which are bottomed in ore. To the north near the quarter post of the section, a good showing of ore is made in a trench that has been dug. Also west of the line in Sec. 35, at several points, the ore has been uncovered in quantity sufficiently large to insure the existence of paying deposits.

The company operates a steam saw-mill, located at the southwest corner of Sec. 36, and have just added a planer, etc., for the convenience of those wishing to build. Upon the hill east of the mine is the village of Stambaugh, named after the president of the company. The town has been laid out and platted and the lots are sold to those wishing to buy; a number of good houses, stores, etc., have been built, and the town has a flourishing, promising look. The gentlemen who own and operate the mine also control the Youngstown mine, at Crystal Falls, and have large mining and metallurgical interests elsewhere.

Mr. F. P. Mills, the manager of this and of the company's Crystal Falls mines, etc., is proving himself thoroughly qualified for the responsible duties that devolve upon him. He has the integrity, energy, education, intelligence, and practical training that will insure his position among the first mining men in the country. Mr. J. N. Porter, the local superintendent, is a gentleman of considerable practical experience in the Ohio coal mines and in the lead mines of Missouri; he has been on the ground for the year past, and endured the mosquitoes and sand flies in a shanty by the river through one season, while clearing the ground and directing the preliminary work of bringing order and civilization out of the roughest wilderness, until now he may enjoy the satisfaction of observing the change which he has aided in perfecting, and partake of the comforts of domestic life in the elegant domicile which he has erected, and into which he has recently removed.

The company began shipping last October and before the close of navigation sent out 29,115 gross tons.

About a mile northwest from the Iron River mine is the

NANIAMO MINE

Which is situated in the northwest quarter of the southwest quarter of section 26, T. 43, R. 35. In its course between these two mines the Iron river makes a bend so that at the Nanaimo its direction is east and west and the mine is near the river on the south side of it. Here, as at the mine just described, there is, apparently, a large amount of ore.

The mining work thus far comprises an open pit about 200 feet in length, east and west, and 90 feet in width in the widest place. In this pit they are stoping, the ore being hoisted and transported to the cars in buckets, which are raised with two derricks. The ore is of good quality, some of it somewhat harder than that found at the Iron River mine, and averages 60% to 62% in metallic iron and about .18% in phosphorus. Below the open pit they have opened underground, the shaft going down 120 feet, at an angle of 65°, westerly dip. These underground workings are not very extensive; they consist as yet, merely of several drifts about fifty feet or so in length, extending in different directions, in some of which they have begun stoping ore. Altogether they are mining and shipping about 25 cars of ore per day.

The shaft has a skip road and the ore, which is hoisted in it, is run out and dumped into ore pockets, which stand over the railroad track. There is a small engine house, supplied with a pumping and hoisting engine and two drums by which the water and the ore are raised from the mine. The mine shipped in 1882 2,250 tons of ore, which was done late in the fall after the railroad was completed.

About midway between this and the Iron River mine is the village of Iron River, which grew last summer very rapidly and contains many good dwellings, stores, and a large hotel. However, there is very little doing in the village now.

It is expected that, possibly, before long the Ontonagon and Brulé River R. R. will be built through this place and consolidate with the Wisconsin and Northern, which is also, it is said, rapidly building north, and has already crossed the State line with its preliminary work. Iron River being at the juncture of the roads, the fact may add somewhat to its business and its prospects.

The Naniamo mine is unquestionably a good one, as they have a depth of ore in sight of 92 feet, and a width at the bottom of 67 feet. They are now (July 15) rising from the underground workings to the bottom of the open cut excavations, and then the whole body of ore, 92 feet deep, will be stoped away, affording a great breast of ore each way.

Capt. Luxmore has an admirable plan for supplying air to his confined underground drifts. The water pumped from the mine is conducted in a launder a distance of about 50 feet north, where it discharges on a narrow overshot wheel, 12 feet diameter; to the wheel is attached a rope pulley which is connected with an intermediate pulley, and this in turn by a belt, with a blower set at the mouth of the shaft. The water affords ample power to give the blower a motion of 1,400 to 1,800 revolutions per minute, giving all the air that is necessary in the mine. As the flow of water from the mine is constant, the blower can be kept in constant motion, and there is no cost. The officers of the company are, John S. McDonald, President; Thomas Luxmore, Superintendent.

The region of country in which these mines are located is a very fine one. The surface is tolerably level, generally covered with a heavy growth of timber. Very little exploring is now being done here; not from any supposed lack of mineral, but from the uncertainty regarding the title to the lands. The Ontonagon and Brulé River Railroad grant covers this country, and the claim of the railroad company to these lands has not yet been confirmed. Not a little of it has been taken by "homesteaders," and also some of the even sections, that have been sold by the government, have been settled on by parties under the homestead law, so that there is likely to be considerable conflict of interests. Until there is a permanent settlement of this matter of titles, there will not be much exploring done, or any great improvement in the territory.

THE FLORENCE MINE (JUNE 10TH)

And the Commonwealth, among the important mines of the Menominee range, are, however, south of the Michigan line and in the State of Wisconsin. The former is situated a short distance southwest of the city of Florence, the county seat of the county of the same name, and is a mine which has every indication of holding a great amount of ore. The mine has a present length of 1,200 feet, extending east and west, and is opened by four shafts numbered from the east to the west. Until recently the mine was worked in open cut. The bottom of these open pit workings now makes the 1st level for the entire mine. At No. 1 shaft this level is 130 feet below the surface, and in it, 170 feet east of the shaft, they are working a stope which is 30 feet wide and 65 feet deep, and is the only stope now working in the mine. At the shaft the ore is 70 feet wide but narrows gradually towards the east, making its width 30 feet at the point now worked. The shaft has been sunk to the 2d level, 70 feet below the first, and at 20 feet a drift has been run to the east to beneath where they are now stoping, and also the same drift extends west to No. 3 shaft. At the bottom they have cross-cutted to the hanging wall 70 feet, and have drifted east and west, distances corresponding with those mentioned above. The plan which they propose to adopt in the underground mining that they have just inaugurated is to work out the ore in chambers, 20 feet and upwards in width, as occasion may suggest, running across and with the deposit, leaving pillars of ore 20 feet square, which will be arranged to stand under each other in succeeding levels, and a floor 20 feet thick in each level for supports.

The shafts 1, 2, 3 in the old mine are in the foot wall, and at each a few feet of cross-cut is required to reach the ore. At the east end of the drifts above mentioned they are connected by a winze.

At No. 2 shaft the ore deposit has a width of 80 feet worked out above the 1st level, but the shaft is sunk to the 2d, and in the bottom a cross-cut extends to the north to the hanging wall, and from it drifts have been opened along the hanging east and west, under similar ones made above, 20 feet below the bottom of the 1st level. These drifts go east to No. 1 and west to No. 3.

Between No. 2 and No. 3 shaft, in the 1st level, a considerable stope of ore remains in the vicinity of the latter. The width of the ore at No. 3 is 90 feet, the widest place in the old mine. The shaft is sinking to the 2d level and a drift is extending east 20 feet, under the bottom corresponding with those from the other shafts. They cross-cut from the shaft to the hanging at 20 feet down and at 70 feet down with the view to work out this 50 feet, leaving only the pillars which with the bottom will take, it is estimated, one-third of the ore. At the same point—20 feet down—a drift is pushing west towards No. 4, which will meet one coming from No. 4 east.

No. 4 is in the lower level, 500 feet west from No. 3, and is indeed an extraordinary "find." The shaft is sunk to the 1st level, 107 feet below the surface, of a line for two skip tracks, and above it an elevated trestle has been reaching easterly to the new ore pockets at the railroad. At the bottom they are cross-cutting south through the ore to the foot-wall, the cross-cut showing in the first 20 feet from the shaft 2d class ore, succeeded by 40 feet of ore, then 12 feet of graphite, followed by 80 feet of ore, thence 35 feet of jasper rock which separates the former from another lense of ore 85 feet wide. Then again 10 feet in rock succeeded by ore in which they are now drifting. They thus have in this drift across the formation, 300 feet of ore, 200 feet of which is apparently clean and first class, averaging 60% in metallic iron, and .30% in phosphorus.

The Florence mine is owned by the Menominee Mining Co., and the work done for some months past has been mainly that which has been above described—sinking the shafts to the 2d level and driving the connecting drifts. A force of about 100 men is employed and they are now, in addition to the sinking and drifting, mining about 100 tons of ore per day. Certainly if there were a demand for the ore, the mine is in shape to furnish a very large amount of it. But unfortunately it is hardly possible to sell any ore, much less this grade of non-Bessemer ores, at the present time, at any price, and the company will simply put the mine in readiness to take out ore whenever it is wanted. A. C. Brown, Agent; J. H. Buddle, Mining Captain.

The railroad reached this point in 1880, and in that year the mine began shipping ore, sending to market 14,143 gross tons.

Year.	Tons.	Year.	Tons.
1881	100,501	1882	160,155
Total			274,299

THE COMMONWEALTH MINE

Was one of the earliest discovered mines in the "range;" it had all the appearance on the surface of being one of the largest deposits of ore ever found in the iron region; but subsequent working, while failing to realize all that had been anticipated, has, nevertheless, developed a mine of considerable proportions, and while the mine at the present moment is showing a less amount of ore than heretofore, there are, nevertheless, sufficient indications to render it nearly certain that other lenses will be found of equal magnitude with these which are, apparently, approaching exhaustion. If there was a demand for the ore it is probable that the mine would furnish an output nearly equal to that which it has any year afforded.

The mine has been worked in open cut and now shows a series of deep open pits, running with the formation east and west. Those at the west end have been abandoned, and the only work now doing is in the No. 4 pit, what was formerly called the Taylor pit, then, as now, the chief pit of the mine. On the surface the width of the ore was equal to its length, which is about 200 feet, and it has been worked to a depth of 130 feet. In the bottom a winze has been sunk 60 feet in depth and from the bottom of it they have opened to the No. 2 shaft. The 60 foot lift made by this winze has been nearly mined out and at the shaft they have sunk 50 feet further and are still going down, and at the same time stoping away from it, hoisting from the skip and also in bucket up the winze. The width of the ore here is 25 feet and it has a length of 150 feet.

At the west end of No. 4 pit, 50 feet below its bottom, they are stoping south in a body of ore that seems to cut across the formation. The ore has a width of 20 feet and they are working a breast stope, taking it all down, but do not, of course, know how far it extends. At this point they have not sunk below the level of the stope. They are mining about 100 tons of ore per day, and employ about 100 men.

No. 5 pit, east of No. 4, is a narrow lense of ore 10 feet wide at the bottom. It has been worked down in open cut 130 feet deep. They have sunk an underground level, but are not working it now. The company has a new discovery on Sec. 32, two and a half miles west of the mine. They have sunk a shaft 80 feet deep, and drifted from the bottom north across the ore 80 feet and south 72 feet. The north drift is mixed ore for the first 12 feet, after which the ore is free of rock and first-class. In the south drift for 25 feet from the shaft the ore is mixed with rock, thence it is found to be clean. East and west at this point the ore is found to extend a great distance; it has been proved for a distance of a quarter of a mile.

The Commonwealth Iron Company holds an estate of 3,000 acres which the own in fee simple, situated in sections 31, 32, 33, 34, 35, all in T. 40 N., R. 18 E., in the State of Wisconsin. The mine is in the S. W. ¼ of Sec. 34. The shipments of ore began in 1880 on the completion of the railroad to the mine, and the output for each year has been as follows:

Years.	Tons.	Year.	Tons.
1880	9,643	1882	115,860
1881	97,410		

Total gross tons 222,915

The officers are H. A. Tuttle, General Manager, Cleveland, Ohio; Capt. W. E. Dickinson, Superintendent.

The company has made very many surface improvements, and altogether, the location is a very healthful and pleasant one.

STATISTICAL TABLE,

Showing the Total Number of Gross Tons of Iron Ore Shipped from the Iron Mines of Michigan. By Charles E. Wright, M. E., Commissioner of Mineral Statistics.

NAMES OF MINES.	Years Unknown.	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	Totals.	NAMES OF MINES.
[1] Cleveland		3,000	1,449	6,343	13,204	7,909	15,787	40,091	11,795	40,364	46,842	44,959	33,355	42,680	75,864	102,112	106,133	132,884	142,658	151,724	133,265	105,858	129,881	145,661	151,554	143,320	113,108	187,234	197,843	204,331	2,531,308	Cleveland.
[1] Jackson	25,000			447	12,442	10,309	28,377	41,295	12,919	46,096	77,237	83,905	65,505	92,287	127,491	130,524	125,908	127,642	132,297	119,910	130,131	94,708	87,283	98,480	80,340	83,121	112,921	120,622	118,939	93,670	2,279,806	Jackson.
[1] Lake Superior						4,658	24,668	33,015	25,195	37,709	78,976	86,773	50,201	68,002	119,935	105,745	125,560	166,582	158,047	195,070	158,428	104,311	119,365	110,570	127,349	109,674	174,747	204,044	262,235	206,509	2,937,418	Lake Superior.
[1] Humboldt (Washington)													4,782	15,150	25,440	35,757	58,462	79,712	48,725	38,841	38,014	27,890	9,712	3,333	16,545	23,921	18,204	14,727	26,302	43,436	528,953	Humboldt (Washington).
[1] New York												8,000	12,214	33,761	43,302	45,665	71,456	94,809	76,381	68,950	70,882	77,017	70,103	58,863	55,581	21,903	57,367	58,512	49,342	56,970	1,031,078	New York.
[1] Lake Angeline												19,500	20,151	24,073	46,607	26,651	39,694	53,467	33,645	35,221	43,931	30,499	30,282	22,539	19,113	28,161	25,420	14,794	18,060	14,518	546,328	Lake Angeline.
[1] Iron Mountain													898	6,860	5,000	3,836					112		1,635								18,341	Iron Mountain.
[1] Argyl (Edwards)														2,843	4,928	17,360	21,450	24,232	26,437	26,026	39,281	2,849	12,804	19,420	10,591	10,333	5,455		4,584	12,461	241,074	Argyle (Edwards).
[1] New England														3,150	9,075	8,257	14,148	24,871	33,359	17,465	181										110,506	New England.
[1] Champion																6,255	21,535	73,161	67,588	68,404	72,782	47,097	56,877	66,602	70,883	73,464	95,203	112,410	144,025	157,506	1,133,792	Champion.
[1] Barnum																14,386	37,503	44,793	45,930	38,481	41,388	40,255	40,914	37,750	38,314	26,680	24,941	24,921	27,783	41,424	525,463	Barnum.
[1] Foster																6,000	14,540	23,458	13,532	18,684	18,607	4,719	847	125			4,804	7,204	2,931	10,393	125,844	Foster.
[1] McComber																		4,836	15,942	25,030	38,332	2,642	10,557	17,282	19,694	30,180	28,962	31,028	25,256	40,790	290,532	McComber.
[1] Rolling Mill																			236	6,772	13,112	14,796	33,638	50,997	38,901	30,773	9,957	15,172	1,568	163	216,085	Rolling Mill.
[1] New York Hematite (Grand Central)																		1,809	2,921	9,925	6,629		750	456	3,307	4,674	2,757	2,063		1,470	37,211	New York Hematite (Grand Central).
[1] Marquette	50,000											3,922	6,652	7,907	7,862	7,977	2,708	3,702		10,924	2,148		3,088		1,659	1,594	1,019				111,164	Marquette.
[1] Winthrop																		3,469	7,319	14,239	31,150	8,248	8,622	27,236	12,549	23,740	27,050	45,247	43,900	23,259	276,028	Winthrop.
[1] Pittsburg & Lake Superior (Cascade)																			4,171	39,495	41,201	15,106	4,070	15,324	20,211	4,704	24,142	18,507	34,750	40,510	257,887	Pittsburg & Lake Superior (Cascade).
[1] Salisbury																				545	11,023	6,730	4,571	20,540	37,868	52,155	39,770	22,587	41,888	42,019	279,468	Salisbury.
[1] Excelsior																				755		1,014	3,029	2,688			4,358				11,844	Excelsior.
[1] Smith																				13,415	9,329		185	225	8,433	16,924	17,531	13,201	5,674		85,250	Cheshire (Smith).
[1] Howe (P. & L. S.)																				1,160	21,498	1,362				1,225	491	285			26,021	Howe (P. & L. S.)
[1] Republic																				11,025	105,453	122,039	110,726	120,005	165,834	170,021	135,151	235,387	234,651	235,108	1,645,292	Republic.
[1] Mitchell (Shenango)																				197	8,552	7,699		5,506	3,807	4,253	14,450	12,753	20,965	33,306	118,764	Mitchell (Shenango).
[1] Michigamme																				141	28,966	45,218	44,756	70,074	25,238	58,622	56,935	52,944	58,115	45,712	486,721	Michigamme.
[1] Rowland																					2,003	379	368	52	196						2,998	Rowland.
[1] Miller																					3,642	1,144									4,786	Miller.
[1] Howell-Hoppock																					1,240	966									2,206	Howell-Hoppock.
[1] Teal Lake																						2,610									2,610	Teal Lake.
[1] Carr																					1,432	918									2,350	Carr.
[1] Albion & Gilmore																					1,186	*162					3,244				4,592	Albion & Gilmore.
[1] Goodrich																					3,258	3,048	1,718		503	7,547	3,992	11,181	10,245	9,987	51,479	Goodrich.
[1] Himrod																					2,065										2,065	Himrod
[1] East Champion (Keystone)																					12,701	4,880	3,348	7,715	14,196	5,401	4,029	10,221	3,408	3,713	69,612	East Champion (Keystone).
[3] Spurr																					31,933	41,765	23,095	20,276	22,801	2,225	1,400		2,754	8,872	155,122	Spurr.
[1] Allen																				8,707	510	130									9,347	Allen.
[1] Saginaw																				18,503	37,138	45,452	52,006	57,122	44,004	54,097	43,620	35,772	30,609	11,254	429,574	Saginaw.
[1] Bay State (Green Bay)																				7,633	1,949						3,366	1,529	1,084	1,183	16,768	Bay State (Green Bay).
[1] Columbia (Kloman)																					21,271	34,348	8,059					6,663	11,158	12,066	93,565	Columbia (Kloman).
[1] Michigan																				1,227	3,212							669			4,439	Michigan.
[1] Manganese (Negaunee)																			4,787	9,154						2,103	10,869				27,582	Manganese (Negaunee).
[1] Cleveland Hematite																								732	634	9,317	19,500	18,847	9,000		58,030	Cleveland Hematite.
[1] Hungerford & Harlow	83																				56										139	Hungerford & Harlow.
[3] Steward																						305			992	1,690					2,987	Steward.
[1] Bessemer																							144	6,801	16,127	8,506	21,681	18,347	16,718	22,221	110,545	Bessemer.
[1] Cambria																								6,329	10,082	3,754	6,860	7,232	18,887	47,545	100,689	Cambria.
[1] Erie																								1,058						2,730	3,788	Erie.
[2] Breen																									5,812	4,806	1,463	5,359			17,440	Breen.
[2] Vulcan																									4,593	31,129	65,350	72,405	85,671	94,042	353,190	Vulcan.
[2] Quinnesec																										26,467	42,127	52,357	43,606	41,240	205,797	Quinnesec.
[2] Emmet																										12,317	22,474	31,136	648		66,575	Emmet.
[2] Norway																										7,533	73,590	198,165	137,558	165,084	581,930	Norway.
[2] Cyclops																										6,275	46,472	14,368	12,214	18,287	97,616	Cyclops.
[1] Pendill																										3,385		3,959	13,566	4,178	25,088	Pendill.
[1] National																										4,191	33,579	29,043	24,690	23,366	115,068	National.
[2] Curry																											13,040	21,741	17,534	13,574	65,889	Curry.
[2] Perkins																											13,402	49,433	10,706	73,648	147,189	Perkins.
[2] Stevenson																											798	23,341	10,856		34,995	Stephenson.
[1] Wheat (Home)																					1,091	2,130					850	3,324	9,040	9,554	25,989	Wheat (Home).
[1] Gribben																					3,595										3,595	Gribben.
[1] Chicago																											941	2,415	5,539		8,895	Chicago.
[1] Orion																											501				501	Orion.
[1] Section 12 (Iron Cliff Company)																											5,026	330	13,242	5,136	23,734	Section 12.
[1] Milwaukee																											941	13,142	31,254	41,200	86,537	Milwaukee.
[2] Cornell																												30,856	11,816		42,672	Cornell.
[3] Taylor																												1,110	9,488	15,031	25,629	Taylor.
[1] Boston																												6,478	14,824	18,077	39,379	Boston.
[1] Sterling																												1,197	4,702	6,235	12,134	Sterling.
[2] Lowell																												14,571			14,571	Lowell,
[2] Chapin																												34,556	134,717	247,505	416,878	Chapin.
[2] Ludington																												8,876	3,365	52,519	64,760	Ludington.
[2] Keel Ridge																												11,445	19,011	23,191	53,647	Keel Ridge.
[1] Indiana																												709		4,280	4,989	Indiana.
[1] Swanzy																													9,337	31,468	40,805	Swanzy.
[1] West Republic																													7,378	27,865	35,243	West Republic.
[1] Hewitt																													4,352	9,667	14,019	Hewitt.
[1] Dalliba																													10,986	44,836	55,822	Dalliba.
[1] Conrad																													355		355	Conrad.
[1] Forest City																													1,895		1,895	Forest City.
Magnetic																					78										78	Magnetic.
Brier Hill																														10,594	10,594	Brier Hill.
Nanaimo																														2,250	2,250	Naniamo.
Iron River																														29,115	29,115	Iron River.
St. Lawrence																														9,932	9,932	St. Lawrence.
Metropolitan																														23,854	23,854	Metropolitan.
Youngstown																														6,198	6,198	Youngstown.
Union																														15,947	15,947	Union.
Webster																														4,413	4,413	Webster.
Wetmore																														1,766	1,766	Wetmore.
Crystal Falls																														1,341	1,341	Crystal Falls.
Fair Camps																														8,121	8,121	Fairbanks.
Jim Pascol																														18,880	18,880	Jim Pascoe.
Wicks																														196	196	Wicks.
Beaufort																														5,532	5,532	Beaufort.
Detroit																														5,402	5,402	Detroit.
Great Western																														587	587	Great Western.
Mastadon																														3,477	3,477	Mastadon.
New Burt																														5,017	5,017	New Burt.
Paint River																														4,615	4,615	Paint River.
Titan																														1,778	1,778	Titan.
Negaunee Concentrating Works																														1,177	1,177	Negaunee Concentrating Works.
Calumet																														5,847	5,847	Calumet.
Total gross tons	75,083	3,000	1,449	6,790	25,646	22,876	68,832	114,401	49,909	124,169	203,055	247,059	193,758	296,713	465,504	510,522	639,097	859,507	813,984	948,553	1,195,234	899,934	881,166	993,311	1,025,129	1,127,583	1,420,745	1,948,334	2,125,729	2,656,933	19,944,005	

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[1] Marquette county. [2] Menominee county. [3] Baraga county.

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